INTERLABORATORY STUDY

88-1

ORGANIC PARAMETERS IN REAGENT WATER AND EFFLUENTS

JULY 1989

Environment Ontario

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Minister

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ORGANIC PARAMETERS

IN REAGENT WATER AND EFFLUENTS

Quality Assurance Office
Laboratory Services Branch

JULY 1989

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1 SUMMARY AND CONCLUSIONS

Round Robin 88-1 represented the initiation of a program of laboratory performance management studies by the Quality Assurance Office, Laboratory Services Branch of the Ontario Ministry of the Environment. It assesses the analytical variability of selected organic parameters (see Sections 3.1.2 and 3.1.3) in spiked reagent water and effluents. Eight laboratories initially agreed to participate in the study. Results were reported from five participants.

Results from this study indicated that environmental laboratories are able to maintain reasonably precise recovery across a scan. Most participants were able to report results from all parameters in one sample ±30% relative to each other (see Appendix 1, Tables 4 and 8). However, these results also suggested that the order of gas chromatographic elution may have an effect on the recovery of a parameter, as some participants demonstrated increasing recovery as each parameter eluted from the column (see Appendix 1, Figures 1-17, and Section 4).

The results from this study indicate that laboratories have biases possibly introduced by differences of standards. Relative to the spiking material, some participants were biased high and some were biased low. This variability between laboratories may be improved through review and adjustment of standard concentrations and/or cross-checking in-house standards with commercial reference materials.

The following tables summarize the performance of each participant.

LAB CODE	SCAN	PERFORMANCE
7002	Volatiles	- Good recovery relative to the design values - No laboratory contamination for range of parameters tested - Good precision within the scan - Consistent performance in matrices tested
	Base/Neutral Extractables	- Good recovery relative to the design values for spiked Reagent Water; lower recovery for spiked effluent samples - No laboratory contamination for range of parameters tested - Good precision within the scan for spiked Reagent Water samples; less consistent for spiked effluent samples - Performance variable in matrices tested
	Acid Extractables	- Good recovery relative to the design values for spiked Reagent Water; lower recovery for spiked effluent samples - No laboratory contamination for range of parameters tested - Good precision within the scan for spiked Reagent Water samples; less consistent for spiked effluent samples - Performance variable in matrices tested

LAB CODE	SCAN	PERFORMANCE
7003	Volatiles	- Biased low relative to design values - Laboratory contamination with Methylene Chloride - Consistent performance within the scan (excluding Methylene Chloride) - Consistent performance in different sample types
	Base/Neutral Extractables	- Good recovery relative to the design values - No laboratory contamination for range of parameters tested - Performance within the scan demonstrates a pattern of decreasing recovery of parameters eluting later from the gas chromatographic column - Performance consistent in matrices tested
	Acid Extractables	- Variable recovery relative to the design values - No laboratory contamination for range of parameters tested - Performance within the scan demonstrates a pattern of over-recovery of parameters eluting later from the gas chromatographic column - Performance variable in matrices tested

LAB CODE	SCAN	PERFORMANCE
7005	Volatiles	- Biased high relative to the design values - Possible laboratory contamination (difficult to assess; see section 4.1) - Variable performance within the scan - Variable performance in matrices tested
	Base/Neutral Extractables	- Good recovery relative to the design values for spiked Reagent Water; lower recovery for spiked effluent samples - No laboratory contamination for range of parameters tested - Good precision within the scan for spiked Reagent Water samples; less consistent for spiked effluent samples - Performance variable in matrices tested
	Acid Extractables	- Good recovery relative to the design values for spiked Reagent Water; lower recovery for spiked effluent samples - No laboratory contamination for range of parameters tested - Performance within the scan demonstrated a pattern of increasing recovery of parameters eluting later from the gas chromatographic column - Performance variable in matrices tested

LAB CODE	SCAN	PERFORMANCE
7007	Volatiles	- Good recovery relative to the design values - No laboratory contamination for range of parameters tested - Good precision within the scan - Consistent performance in matrices tested
	Base/Neutral Extractables	- No results submitted
	Acid Extractables	- No results submitted

LAB CODE	SCAN	PERFORMANCE
7008	Volatiles	- Variable performance relative to the design values - No laboratory contamination for range of parameters tested - Performance within the scan demonstrated a pattern of increasing recovery of parameters eluting later from the gas chromatographic column - Variable performance in matrices tested
	Base/Neutral Extractables	- Variable recovery relative to the design values - No laboratory contamination for range of parameters tested - Performance within the scan demonstrated a pattern of decreasing recovery of parameters eluting later from the gas chromatographic column - Performance variable in matrices tested
	Acid Extractables	- Variable recovery relative to the design values - No laboratory contamination for range of parameters tested - Variable performance within the scan; some samples more consistent than others - Performance variable in matrices tested

2 INTRODUCTION

Interlaboratory performance studies, or round robins, are conducted to assess the comparability of data among different laboratories. As well, they help in the identification of biases, precision or accuracy problems, aid in improving individual laboratory performance, and maintain performance standards. The Quality Assurance Office, Laboratory Services Branch (LSB) of the Ministry of the Environment (MOE) has instituted an on-going program of round robins to assess and promote the performance of environmental laboratories providing analytical services for a variety of different programs.

Round Robin 88-1 was designed to assess the analytical variability of organic parameters in reagent water and two different effluent matrices. The parameter list was chosen from four different test groups listed in the MISA (Municipal and Industrial Strategy for Abatement) General Regulation (1). Participants were requested to use methods which conformed to the MISA analytical principles and protocols given in the General Regulation (1).

Eight laboratories were invited to participate in this round robin: 1 government laboratory (MOE), 2 industrial laboratories, and 5 commercial laboratories. Not all of the participants produced final results for all of the samples submitted (see section 3.4). A list of participants is included in Appendix 2.

Two sets of nine (9) samples (18 in total) were distributed to each participant, consisting of spiked reagent water and two different spiked effluents. One set of samples was spiked with volatile organic compounds (MISA Test Group 16) and the other set of samples was spiked with extractable organic compounds (MISA Test Groups 19, 20, and 23). While the parameter list was selected from the MISA regulations, the spiking materials contained additional compounds. Some of the participants reported results for these compounds, but this was an option. Details of sample preparation and distribution are given in Sections 3.1 and 3.2. Analytical methodology and data handling are presented in Sections 3.3 and 3.4. Final results are presented and discussed in Section 4.0.

3 PROCEDURE

3.1 Preparation of Samples

3.1.1 Preparation of Matrices

a) Reagent Water

Volatile Samples

Two (2) litres of deionized, distilled water were collected in a clean Erlenmeyer flask, and purged with a gentle stream of nitrogen gas overnight. Care was taken that no plastic materials came into contact with the purged water. (This was carried out in a separate QC laboratory, well removed from routine organic laboratory atmosphere which can contribute artifacts to the analysis.)

Extractable Samples

Non-purged, deionized, distilled water was used for the extractable samples. Care was taken that no plastic materials came into contact with the water.

b) Effluent Matrices

Bulk effluent samples were provided by two different organic chemical manufacturers in southern Ontario. The two effluents were designated Effluent 1 and Effluent 2.

Approximately 19-20 litres of each effluent were received in large glass bottles. Since 25 litres were required for the round robin, the effluents were transferred to separate 50 litre stainless steel containers that had been carefully rinsed with tap water, followed by a distilled, deionized water rinse. Distilled, deionized water was added to each effluent to bring the total volume up to approximately 25 litres. The effluents were stirred overnight to form a homogeneous mixture using a stirrer with a Teflon shaft and prop.

3.1.2 Preparation of Volatile Samples

Samples for volatile analysis were prepared in 40 mL glass vials that had screw caps with Teflon-lined septa. Sample vials were filled almost to overflowing with the sample matrices, with the miniscus rising above the edge of the vial. The volume of 40 mL was confirmed by weighing the vials before and after filling (±1 mL). The same procedure was used for both the purged reagent water and the two effluents.

The following groups of samples were prepared for each participating laboratory:

Table 1 - Volatile Samples

Sample ID	Matrix	Spiking Level
VOL 1A	Reagent Water	Blank
VOL 1B	Reagent Water	Low Spike
VOL 1C	Reagent Water	High Spike
VOL 2A	Effluent 1	Blank
VOL 2B	Effluent 1	Low Spike
VOL 2C	Effluent 1	High Spike
VOL 3A	Effluent 2	Blank
VOL 3B	Effluent 2	Low Spike
VOL 3C	Effluent 2	High Spike

All samples were spiked using USEPA ampoule WP781, Sample #3: GC/MS Purgeables - II. The following mixture of organic parameters was stated to be present in the ampoule by the supplier:

EPA WP781
- Methylene Chloride (Dichloromethane)
- 1,1-Dichloroethane (both isomers)
- t-1,2-Dichloroethylene
- 1,2-Dichloroethane
- Carbon Tetrachloride
- 1,2-Dichloropropane
- Trichloroethene
- Dibromochloromethane
- 1,1,2,2-Tetrachloroethane
- Chlorobenzene

The same concentration level for the low spike was used in both effluent samples (i.e. samples 2B and 3B were spiked with the same volume of spiking material). Similarly, the same concentration level for the high spike was used in both effluents. The reagent water was spiked with slightly lower levels of spiking solution than that used for the effluents, in order to vary the design levels of each compound.

All sample spiking was done using 10, 25, or 50 microlitre syringes, depending on the spiking level. The spiking solution was expelled from the syringe below the surface of the matrix. The screw cap septa (Teflon side towards the sample) was carefully slid across the top of the vial and quickly screwed on, so as to avoid trapping any air bubbles in the vial. The samples were gently inverted three or four times to mix the contents.

3.1.3 Preparation of Extractable Samples

Samples for analysis of Extractables were prepared in 1 litre (1000 mL) amber glass bottles with screw caps. Sample containers were filled by weighing the containers (mean weight 460 g ±5 g) and adding an approximate volume of 800 mL of liquid to a final weight of 1260 g. The same procedure was used for both the non-purged reagent water and the two effluents.

The following groups of samples were prepared for each participating laboratory:

Table 2 - Extractable Samples

Sample ID	Matrix	Spiking Level
EXTR 1A	Reagent Water	Blank
EXTR 1B	Reagent Water	Low Spike
EXTR 1C	Reagent Water	High Spike
EXTR 2A	Effluent 1	Blank
EXTR 2B	Effluent 1	Low Spike
EXTR 2C	Effluent 1	High Spike
EXTR 3A	Effluent 2	Blank
EXTR 3B	Effluent 2	Low Spike
EXTR 3C	Effluent 2	High Spike

The low spikes in reagent water and both effluents were prepared using Supelco ampoule Base Neutral 2 (Cat. #4-8855) and USEPA ampoule WP985: GC/MS Acids. The high spike in reagent water was prepared using Supelco ampoule Base Neutral 2 only. The high spikes in both effluents were prepared using Supelco ampoule Base Neutral 2 and Supelco ampoule Phenol Mix 604-M (Cat. #4-8859). The following parameters were stated to be present in the ampoules by the suppliers:

EPA WP985 and Supelco Phenol Mix 604-M	2,4,6-Trichlorophenol 4-Chloro-3-methylphenol 2-Chlorophenol 2,4-Dichlorophenol 2,4-Dimethylphenol 2-Nitrophenol 4-Nitrophenol 2,4-Dinitrophenol * 2-Methyl-4,6-Dinitrophenol Pentachlorophenol Phenol
	* Supelco ampoule ONLY
Supelco Base Neutral 2	1,3-Dichlorobenzene 1,2-Dichlorobenzene Hexachlorobutadiene Naphthalene bis(2-Chloroethoxy) methane Acenaphthene Fluorene 2,4-Dinitrotoluene Hexachlorobenzene Anthracene Diethyl phthalate Pyrene Chrysene Benzo(a)Anthracene Dibenzo(a,h)Anthracene

All spiking was done using 25, 50 or 100 microlitre syringes. Syringes were rinsed with a small aliquot of spiking mixture prior to filling with the required volume. Air bubbles were expelled before injecting the spiking mixture below the surface of the matrix. Once the aliquot of spiking mixture was injected into the matrix, the containers were capped and placed on a roller mixer for approximately 10 minutes.

3.2 Sample Distribution

Prior to sample preparation, the participating laboratories received a letter of notification. All the commercial laboratories confirmed their participation by letter or telephone. A list of participating laboratories and examples of correspondence with the participants are included in Appendix 2.

The two sets of nine samples for each participating laboratory were packaged in cardboard boxes. Two boxes per laboratory were shipped via Purolator courier on June 20, 1988. With one exception, the boxes were all received by the participants on June 21, 1988. The one late delivery was received on June 23, 1988. One laboratory reported that two sample bottles for Extractables had been broken during transit. These samples were not replaced due to lack of extra sample matrix material.

3.3 Analytical Methodology

Participants were requested to analyze the samples using routine in-house methods that complied with the principles and protocols outlined in Schedule 3 of the MISA General Regulation (OR695/88).

Participants were not required to provide detailed information regarding methodology. Some participants provided information regarding instrument model and column used, and all participants stated that additional information was available on request. Participants were later requested to indicate whether they corrected for recovery of their surrogate standard(s) before reporting their final results. All participants provided this information and this is included in Section 4.

3.4 Data Handling

Results were submitted to MOE-LSB in written form by mail. All data were manually entered by laboratory code into an electronic spreadsheet. Blank spaces were left when a laboratory did not report results for a specific parameter that was present in the spiking material. A "0" was entered when a laboratory reported values for a specific parameter in some samples, but reported "Not Detected" in other spiked samples. The spiking materials contained additional parameters from that specified in the MISA regulation. Not all participants reported results for these parameters.

Final percent participation was as follows: Volatiles - 63%, Extractables - 50%. Results were received from only three (out of five) private labs, the MOE laboratory, and one industrial laboratory. (The industrial laboratory submitted results for volatiles only. A letter, explaining that manpower restrictions during that time period prevented the analysis of the extractable samples, was included.) Telephone contact with the laboratories not reporting results indicated that the other industrial laboratory had withdrawn from the round robin. The private laboratories not reporting results had instrument breakdowns or an unexpected increase in workload, preventing them from analyzing the round robin samples.

Between-laboratory variability was determined by calculating the mean and standard deviation from the results reported (n=5 for volatiles and n=4 for Extractables). The minimum and maximum values were also identified to give an indication of the range. Outliers were not removed from the data set when calculating between-laboratory variability.

Results were converted to percent recovery based on the design value of the spiking material. These values are presented in an accompanying table in Appendix 1. Each laboratory's results were corrected for background values present in the unspiked matrices using the values reported by each individual laboratory.

Included in Appendix 1 are bar graphs of the recovery for each parameter from each participating laboratory (Figure 1-17). Each graph represents a different sample and the parameters are arranged left to right in order of gas chromatographic elution (based on a DB-5 capillary column). Outliers were not deleted from the data set when preparing the graphs. All results are presented as percent recovery relative to the design value, and are corrected for background values as noted above.

4 RESULTS AND DISCUSSION

Performance of each participant was assessed according to the following criteria: recovery of each parameter relative to the design values, laboratory background contamination of selected parameters, consistency of performance within the scan, and differences in performance of spiked Reagent Water samples versus spiked effluent samples.

4.1 Volatile Samples

LABORATORY 7002

Laboratory 7002 had consistent results relative to the design values. Mean recoveries ranged from 75% in sample 2B (low spike, Effluent 1) to 99% for sample 3B (low spike, Effluent 2). The lowest parameter recovered was 1,1-Dichloroethene in sample 3C (high spike, Effluent 2). The highest parameter recovered was Chlorobenzene in sample 1C (high spike, Reagent Water).

Laboratory 7002 did not demonstrate any significant laboratory contamination problems. A small amount (2.05 ppb) of Methylene Chloride was reported in the unspiked Reagent Water (sample 1A).

The results for Carbon Tetrachloride were corrected for background values in Samples 3B and 3C (low and high spikes, Effluent 2). Despite this correction, it appears that Laboratory 7002 had significant over-recovery of Carbon Tetrachloride in these two samples (363% and 149% respectively). However, the between-laboratory variability in determining the background level of Carbon Tetrachloride in Effluent 2 (range from 25.6-93 ppb in sample 3A, unspiked Effluent 2), makes it difficult to select the "best" value to use for background correction.

Laboratory 7002 had consistent performance within the scan. The greatest variability was for sample 3B (low spike, Effluent 2) with a mean recovery of 99% and a range of 49-363%. Order of gas chromatographic elution did not appear to affect the recovery of the different parameters. No patterns were evident in the results (see Figures 1-6) for this laboratory.

LABORATORY 7003

Laboratory 7003 reported low results relative to the design values. This bias suggests that their standard is high relative to the other laboratories' standards and to the spike solution. Mean recoveries ranged from 26% (sample 1B, low spike, Reagent Water) to 48% (sample 3C, high spike, Effluent 2).

Laboratory 7003 appears to have some laboratory contamination problems, as they had the highest reported Methylene Chloride values from all participants in the unspiked samples (samples 1A, 2A, and 3A). As a result, they reported consistently higher values for Methylene Chloride in all samples and had higher recovery of the spiked material in all samples. This was particularly significant for samples 2C (high spike, Effluent 1, recovery = 219%) and 3B (low spike, Effluent 2, recovery = 61%).

Laboratory 7003's result for Carbon Tetrachloride in sample 3B (low spike, Effluent 2) was lower than the reported value for the unspiked sample (sample 3A). As a result, Laboratory 7003 appears to have a negative recovery for Carbon Tetrachloride in this sample (see Appendix 1, Figure 5). As noted above, the between-laboratory variability for the background value of Carbon Tetrachloride in Effluent 2 was too great to determine the appropriate value to use for background correction.

Laboratory 7003 had a consistent but low level of performance within a scan, demonstrating good precision, but not accuracy. The exceptions were for Methylene Chloride in sample 2C (high spike, Effluent 1) and Carbon Tetrachloride in sample 3B (low spike, Effluent 2). Order of gas chromatographic elution did not appear to affect the recovery of any parameter. No patterns were evident in the results.

LABORATORY 7005

Laboratory 7005 reported an instrument computer malfunction which caused an irretrievable loss of their original volatile data. They were able to reanalyze the samples, but qualified their data, as they were concerned that headspace in the sample vials may have adversely affected the samples. In this situation, one would expect that their results would be biased low. However, Laboratory 7005's results tended to be reported high (except for sample 2B, low spike, Effluent 1), relative to the design values. This bias suggests that Laboratory 7005 has a low set of standards, relative to the other laboratories' standards and to the spike solution.

Laboratory 7005 may have some laboratory contamination problems, but this was difficult to assess from this data set. This laboratory did not report any Methylene Chloride in the unspiked Reagent Water (sample 1A) but did report some in the unspiked Effluent 1 (sample 2A). They were the only participant to report values for parameters other than Methylene Chloride and Carbon Tetrachloride in the unspiked Effluent 2 (sample 3A, Table 3 in Appendix 1). This variability in results made it difficult to determine if background correction is necessary for results reported from this laboratory.

Laboratory 7005 had variable performance within a scan. Mean recovery within a scan ranged from 97% (sample 3B, low spike, Effluent 2) to 135% (sample 3C, high spike, Effluent 21). The range of results was from 46-162% and 87-179% respectively. Order of gas chromatographic elution did not appear to affect the recovery of the parameters. No patterns were evident in the results.

LABORATORY 7007

Laboratory 7007 had very consistent performance relative to the design values. Mean recovery ranged from 84% (sample 1B, low spike, Reagent Water) to 105% (sample 2C, high spike, Effluent 1). The lowest parameter recovered was Carbon Tetrachloride (28%) in sample 3C (high spike, Effluent 2). The highest parameter recovered was Trichloroethene (131%) in sample 1C (high spike, Reagent Water).

Laboratory 7007 did not appear to have a laboratory contamination problem. A small amount (1.2 ppb) of Methylene Chloride was reported in the unspiked Reagent Water (sample 1A), but over-recovery in the spiked Reagent Water samples was not observed (1B Methylene Chloride = 85%, 1C Methylene Chloride = 91%). No Methylene Chloride was reported in Effluent 1 (sample 2A) and this laboratory reported the smallest value of Methylene Chloride in Effluent 2 (sample 3A).

Laboratory 7007 had very good performance within a scan. The greatest range of variability was for sample 3C (high spike, Effluent 2), with a range of 28-119% recovery across the scan. Order of gas chromatographic elution had no apparent effect on recovery of parameters across the scan. No patterns were evident in the results.

LABORATORY 7008

Laboratory 7008 did not report results for 1,2-Dichloropropane.

Laboratory 7008 had variable performance relative to the design values. Some parameters had excellent recovery (e.g. 1,1,2,2-Trichloroethane 100% recovery in sample 1C), while others had poor recovery (e.g. 1,2-Dichloroethane 0% recovery in samples 3B and 3C). Mean recovery varied from 67% (sample 2B, low spike, Effluent 1) to 86% (sample 1C, high spike, Reagent Water).

Laboratory 7008 did not appear to have any laboratory contamination problems. No Methylene Chloride was reported in the unspiked Reagent Water (sample 1A). Recoveries for Methylene Chloride in the spiked Reagent Water samples (samples 1B and 1C) were also low (33% and 30% respectively).

Laboratory 7008 had variable performance within the scan. Range of recovery varied from 0-139% in sample 3C (high spike, Effluent 2) to 9-107% in sample 2B (low spike, Effluent 1). Order of gas chromatographic elution may have had some effect on the performance of Laboratory 7008. There is a suggestion of a pattern in the results displayed in Appendix 1, Figures 1-6. Parameters that elute earlier from the column appear to have lower recovery than those eluting later in the scan. As the earlier eluting parameters are more volatile and are more sensitive to gas chromatographic conditions, it is possible that Laboratory 7008 should adjust their gas chromatographic conditions to achieve more consistent performance across the scan.

4.2 Base/Neutral Extractable Samples

LABORATORY 7002

Laboratory 7002 indicated in their report that they corrected for recovery based on their surrogate standards. As a result, they reported results close to the design values for the spiked reagent water samples (samples 1B and 1C). However, recovery correction for samples 2B, 2C, (low and high spikes, Effluent 1) 3B, and 3C (low and high spikes, Effluent 2) did not enable them to report results close to the design values. Mean recovery for sample 2B (low spike, Effluent 1) was 54%, for 3B (low spike, Effluent 2) was 64%, and for 3C (high spike, effluent 2) was 64%.

Laboratory 7002 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7002 had consistent performance within the scan for the spiked Reagent Water samples (samples 1B and 1C). Recoveries ranged from a low of 62% for Dibenzo(a,h)Anthracene in sample 1C to a high of 149% for Naphthalene in sample 1C. The exception was for Dibenzo(a,h)Anthracene in sample 1B, which was not detected (0% recovery).

Performance across the scan was not as consistent in the spiked effluent samples (samples 2B, 2C, 3B, and 3C). Recoveries ranged from 0% for Hexachlorobenzene in samples 3B and 3C, to 122% for 2,4-Dinitrotoluene in sample 3C. It appears that the methodology used by Laboratory 7002 for this type of analysis is not as effective for spiked matrix samples as for spiked Reagent Water samples.

LABORATORY 7003

Laboratory 7003 reported consistent results relative to the design values. Mean recoveries ranged from 61% (sample 1B, low spike, Reagent Water) to 95% (sample 3B, low spike, Effluent 2). Individual results range from a low of 24% for Dibenzo(a,h)Anthracene in sample 3B (low spike, Effluent 2) to a high of 137% for Hexachlorobenzene in sample 2B (low spike, Effluent 1) and for 2,4-Dinitrotoluene in sample 3B (low spike, Effluent 2).

Unlike Laboratory 7003's results for Volatiles (see section 4.1), the results for Base/Neutral Extractables were not biased low relative to the spiking standard or to the other labs' standards.

Laboratory 7003 did not correct their results relative to their surrogate standards.

Laboratory 7003 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7003's performance within a scan does demonstrate a pattern (see Appendix 1, Figures 7-12). Recovery of the parameters eluting first from the gas chromatographic column appears to be higher than those parameters eluting later. Adjustment of the gas chromatographic conditions may result in more consistent recovery across the scan.

LABORATORY 7005

Laboratory 7005 did not report results for Hexachlorobenzene.

Laboratory 7005's performance relative to the design values varied, depending on the sample matrix. Best results were observed for the spiked Reagent Water samples (mean recovery for sample 1B = 74% and mean recovery for sample 1C = 81%). However the results for the spiked effluent samples (samples 2B, 2C, 3B, and 3C) were low relative to the design values (mean recovery = 51%, 64%, 55%, and 59% respectively). It appears that the methodology used by Laboratory 7005 for this type of analysis may not be as effective for spiked effluent samples as for spiked Reagent Water samples.

Laboratory 7005 did not correct their results for recovery based on their surrogate standards.

Laboratory 7005 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7005's performance within the scan is reasonably consistent in the spiked Reagent Water samples (samples 1B and 1C) but does not appear to be significantly different from the spiked effluents (samples 2B, 2C, 3B, and 3C). The range of recovery was greatest in sample 1C (35-118%, difference of 83%) and sample 2C (31-114%, difference of 83%). The sample with the least variability was 3C (35-82%, difference of 47%).

Order of gas chromatographic elution does appear to affect the recovery of parameters by Laboratory 7005. This is particularly noticeable in samples 2B and 3B (Appendix 1, Figures 9 and 11), but less in the results from the other samples (Appendix 1, Figures 7, 8, 10, and 12).

LABORATORY 7008

Laboratory 7008 did not report results for the following parameters: 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, Hexachlorobutadiene, Diethylphthalate, and Hexachlorobenzene.

Laboratory 7008 had variable performance relative to the design values. Mean recovery ranged from 51% for sample 3C (high spike, Effluent 2) to 78% for sample 1B (low spike, Reagent Water). Individual recoveries ranged from 6% for Chrysene in sample 3C (high spike, Effluent 2) to 116% for Bis(2-Chloroethoxy)methane in sample 1B (low spike, Reagent Water).

Laboratory 7008 did not correct their results for recovery based on their surrogate standard.

Laboratory 7008 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7008's performance within a scan is more difficult to assess due to the gaps caused by unreported parameters (see Appendix 1, Figures 7-12). The results show a pattern of decreasing recovery across the scan. This suggests that the order of gas chromatographic elution affects the recovery of the parameters. It is possible that adjustments of the gas chromatographic conditions may improve the consistency of recovery across the scan.

4.3 Acid Extractable Samples

LABORATORY 7002

Laboratory 7002 indicated in their report that they corrected for recovery based on their surrogate standards. As a result, they reported results close to the design values for the spiked Reagent Water sample (sample 1B, mean recovery = 68%). However, recovery correction for samples 2B, 2C, 3B, and 3C (spiked effluent samples) did not result in their consistently reporting results close to the design values (mean recovery ranged from 36-61%). This suggests that the methodology used by Laboratory 7002 may not be as effective for spiked matrix samples as for spiked reagent Water samples for the analysis of Acid Extractables. This is similar to the results noted for the analysis of Base/Neutral Extractables by Laboratory 7002.

Laboratory 7002 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7002's performance within the scan was variable in the spiked effluent samples and in the spiked Reagent Water sample. Recovery ranged from 36-126%, with two parameters not detected in sample 1B (low spike, Reagent Water). In sample 3C (high spike, Effluent 2) recovery ranged from 25-142% with all parameters detected. In sample 2C (high spike, Effluent 1), recovery ranged from 14-84% with one parameter not detected.

In some samples, the order of gas chromatographic elution appeared to affect recovery of different parameters. Sample 1B (low spike, Reagent Water) shows a pattern of decreasing recovery while samples 3B and 3C (low and high spikes, Effluent 2) demonstrate a pattern of increasing recovery. This data set is not large enough to determine the overall performance of Laboratory 7002 for Acid Extractable analysis.

LABORATORY 7003

Laboratory 7003 had considerable variability in their performance relative to the design values. Results ranged from non-detection (e.g. 0% for 4-Nitrophenol in sample 1B, low spike, Reagent Water) to very high over-recovery (e.g. 569% for Pentachlorophenol in sample 3B, low spike, Effluent 2). Mean recovery ranged from 37% for sample 1B (low spike, Reagent Water) to 168% for sample 3B (low spike, Effluent 2). This latter result may not truly reflect the performance of Laboratory 7003 on this sample, as the recovery for

Pentachlorophenol was 569% and for 2-Methyl-4,6-Dinitrophenol the recovery was 351%. Excluding these two results, the mean recovery would be 95% for sample 3B, with a range of 46-142%.

Laboratory 7003 did not correct their results for recovery based on their surrogate standards.

Laboratory 7003 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7003 had considerable variability of performance within the scan. Results varied from non-detection for several parameters to high over-recovery of others (see Appendix 1, Figures 13-17 for a pictorial representation). Over-recovery occurred more frequently for parameters that elute at the end of the scan, suggesting that order of gas chromatographic elution may affect Laboratory 7003's performance. Adjustment of the gas chromatographic conditions may help improve the performance for some of the parameters in the scan.

LABORATORY 7005

Laboratory 7005 was the only laboratory to report results for 2,4-Dinitrophenol in samples 2C and 3C (high spike, Effluent 1 and high spike, Effluent 2, respectively). These results were not included in Figures 15 and 17 in Appendix 1.

Laboratory 7005's performance was fairly consistent relative to the design values for the spiked Reagent Water sample (sample 1B) except for 2,4-Dimethylphenol (0% recovery) and 4-Nitrophenol (10% recovery). Results for the spiked effluent samples (samples 2B, 2C, 3B, and 3C) were low relative to the design values. This suggests that the methodology used by Laboratory 7005 was not as effective for spiked effluent samples as for spiked Reagent Water samples.

Laboratory 7005 did not correct their results for recovery based on their surrogate standards.

Laboratory 7005 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7005's performance within the scan demonstrates a pattern (see Appendix 1, Figures 13-17). Laboratory 7005 reported increasing recovery for parameters that eluted later in the scan. This suggests that order of gas chromatographic elution affects the performance of Laboratory 7005. Adjustment of gas chromatographic conditions may improve the performance across the scan.

LABORATORY 7008

Laboratory 7008 did not report results for 2-Nitrophenol and 2-Methyl-4,6-Dinitrophenol.

Laboratory 7008 had variable performance relative to the design values in all of the samples. Recovery ranged from 9% for Pentachlorophenol in sample 3C (high spike, Effluent 2) to 200% for 2,4-Dimethylphenol in sample 2C (high spike, Effluent 1). Results in the spiked Reagent Water sample (sample 1B) ranged from 45-194% recovery. Two parameters were reported not detected in the low spike for Effluent 1 (sample 2B).

Laboratory 7008 did not correct their results for recovery based on their surrogate standards.

Laboratory 7008 did not appear to have any laboratory contamination effects, as no parameters were detected in the unspiked samples (samples 1A, 2A, and 3A).

Laboratory 7008 had variable performance across the scan in three of the five samples submitted for Acid Extractables. As noted above, recovery ranged from non-detected (sample 2B, low spike, Effluent 1) to 200% (sample 2C, high spike, Effluent 1). In samples 3B and 3C, Laboratory 7008 had much more consistent, though low performance. Sample 3B (low spike, Effluent 2) had a range of 18-39% recovery (difference = 21%) and sample 3C (high spike, Effluent 2) had a range of 9-35% recovery (difference = 27%). The more consistent, though low performance across the scan for the latter two samples cannot be explained based on the small data set of this round robin.

5 REFERENCES

1. Ontario Regulation 695/88 under the Environmental Protection Act; Effluent Monitoring - General

2. Federal Register (USA); Part VIII, Environmental Protection Agency; 40 CFR Part 136; Friday, October 26, 1984

6 APPENDIX 1 - FULL DATA SET

TABLE 1 - ROUND ROBIN 88-1 RESULTS: VOLATILES SAMPLES 1A - 1C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7007	7008	MEAN	MIN	MAX	S.D.
1A	METHYLENE CHLORIDE	--	2.05	3.6		1.2		2.3	1.2	3.6	1.2
1A	1,1-DICHLOROETHENE	--									
1A	TRANS 1,2-DICHLOROETHENE	--									
1A	1,2-DICHLOROETHANE	--									
1A	CARBON TETRACHLORIDE	--									
1A	1,2-DICHLOROPROPANE	--									
1A	TRICHLOROETHENE	--									
1A	DIBROMOCHLOROMETHANE	--									
1A	1,1,2,2-TETRACHLOROETHANE	--									
1A	CHLOROBENZENE	--									
1B	METHYLENE CHLORIDE	9.2	10.37	4.2	13.2	9	3	8.0	3	13.2	4.3
1B	1,1-DICHLOROETHENE	10	6.19	1.6	11.9	9.3	8	7.4	1.6	11.9	3.9
1B	TRANS 1,2-DICHLOROETHENE	5.4	4.99	1.3	5.6	5.65	4	4.3	1.3	5.65	1.8
1B	1,2-DICHLOROETHANE	5.4	4.46	1.8	5.5	5.3	4	4.2	1.8	5.5	1.5
1B	CARBON TETRACHLORIDE	10	6.65	2.4	14	9.2	9	8.3	2.4	14	4.2
1B	1,2-DICHLOROPROPANE	8	5.95	2.4	8.9	7.2		6.1	2.4	8.9	2.8
1B	TRICHLOROETHENE	10.2	6.62	3	13.8	9.95	9	8.5	3	13.8	4.0
1B	DIBROMOCHLOROMETHANE	6	4.48	2	6.8	5.4	8	5.3	2	8	2.3
1B	1,1,2,2-TETRACHLOROETHANE	10	7.35	2.8	5.5	8.7	12	7.3	2.8	12	3.4
1B	CHLOROBENZENE	8.2	6.55	2.6	8.6	8.1	7	6.6	2.6	8.6	2.4
1C	METHYLENE CHLORIDE	23	24.05	13.2	20.5	22.1	7	17.4	7	24.05	7.1
1C	1,1-DICHLOROETHENE	25	12.44	6.2	18	21.95	17	15.1	6.2	21.95	6.0
1C	TRANS 1,2-DICHLOROETHENE	13.5	13.05	4.8	12.8	14.8	11	11.3	4.8	14.8	3.9
1C	1,2-DICHLOROETHANE	13.5	12.88	6.1	14.3	14.9	11	11.8	6.1	14.9	3.5
1C	CARBON TETRACHLORIDE	25	20.43	10.3	34.3	26	21	22.4	10.3	34.3	8.8
1C	1,2-DICHLOROPROPANE	20	17.81	6.8	23.8	21		17.4	6.8	23.8	7.4
1C	TRICHLOROETHENE	25.5	19.76	8.4	36.7	33.35	25	24.6	8.4	36.7	11.3
1C	DIBROMOCHLOROMETHANE	15	14.96	6.5	19.1	16.4	20	15.4	6.5	20	5.4
1C	1,1,2,2-TETRACHLOROETHANE	25	19.53	10.9	17.4	19.8	25	18.5	10.9	25	5.1
1C	CHLOROBENZENE	20.5	22.47	7.7	21.2	25	19	19.1	7.7	25	6.7

REAGENT WATER: 1A - UNSPIKED; 1B - LOW SPIKE; 1C - HIGH SPIKE

TABLE 2 - ROUND ROBIN 88-1 RESULTS: VOLATILES SAMPLES 2A - 2C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7007	7008	MEAN	MIN	MAX	S.D.
2A	METHYLENE CHLORIDE	-		3.8	3.4		2	3.1	2	3.8	0.9
2A	1,1-DICHLOROETHENE	-									
2A	TRANS 1,2-DICHLOROETHENE	-									
2A	1,2-DICHLOROETHANE	-									
2A	CARBON TETRACHLORIDE	-									
2A	1,2-DICHLOROPROPANE	-									
2A	TRICHLOROETHENE	-									
2A	DIBROMOCHLOROMETHANE	-									
2A	1,1,2,2-TETRACHLOROETHANE	-									
2A	CHLOROBENZENE	-									
2B	METHYLENE CHLORIDE	11.5	11.21	6.1	13.3	10.9	3	8.9	3	13.3	4.2
2B	1,1-DICHLOROETHENE	12.5	6.08	2.3	6.9	11.45	3	5.9	2.3	11.45	3.6
2B	TRANS 1,2-DICHLOROETHENE	6.75	7.29	1.8	4.4	6.8	5	5.1	1.8	7.29	2.2
2B	1,2-DICHLOROETHANE	6.75	5.96	2.6	7.3	7.5	5	5.7	2.6	7.5	2.0
2B	CARBON TETRACHLORIDE	12.5	8.56	3.4	15	12	10	9.8	3.4	15	4.3
2B	1,2-DICHLOROPROPANE	10	7.33	3.3	12.5	9.6		8.2	3.3	12.5	3.9
2B	TRICHLOROETHENE	12.75	8.81	4.4	20.6	15.4	11	12.0	4.4	20.6	6.2
2B	DIBROMOCHLOROMETHANE	7.5	5.54	2.6	9	7.2	8	6.5	2.6	9	2.5
2B	1,1,2,2-TETRACHLOROETHANE	12.5	7.17	2.7	5.7	9	10	6.9	2.7	10	2.9
2B	CHLOROBENZENE	10.25	6.82	2.9	8.7	9.55	7	7.0	2.9	9.55	2.6
2C	METHYLENE CHLORIDE	28.75	23.47	66.8	28.3	24.6	10	30.6	10	66.8	21.4
2C	1,1-DICHLOROETHENE	31.25	15.05	6.2	32.1	23.75	17	18.8	6.2	32.1	9.7
2C	TRANS 1,2-DICHLOROETHENE	16.875	10.99	4.1	23.4	16	11	13.1	4.1	23.4	7.1
2C	1,2-DICHLOROETHANE	16.875	15.29	6.1	27.6	17.9	12	15.8	6.1	27.6	7.9
2C	CARBON TETRACHLORIDE	31.25	27.08	9.4	39.5	29.4	27	26.5	9.4	39.5	10.8
2C	1,2-DICHLOROPROPANE	25	21.03	8	37.6	24.6		22.8	8	37.6	12.2
2C	TRICHLOROETHENE	31.875	29.43	10.5	56.8	39.55	30	33.3	10.5	56.8	16.9
2C	DIBROMOCHLOROMETHANE	18.75	17.63	6.8	33.5	19.9	25	20.6	6.8	33.5	9.8
2C	1,1,2,2-TETRACHLOROETHANE	31.25	21.54	7.6	27.2	22.1	27	21.1	7.6	27.2	8.0
2C	CHLOROBENZENE	25.625	24.45	7.3	35.8	27.65	22	23.4	7.3	35.8	10.4

EFFLUENT 1: 2A - UNSPIKED; 2B - LOW SPIKE; 2C - HIGH SPIKE

TABLE 3 - ROUND ROBIN 88-1 RESULTS: VOLATILES SAMPLES 3A - 3C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7007	7008	MEAN	MIN	MAX	S.D.
3A	METHYLENE CHLORIDE	-	2.09	38.9	8.9	1.2	5	11.2	1.2	38.9	15.8
3A	1,1-DICHLOROETHENE	-			7.6						
3A	TRANS 1,2-DICHLOROETHENE	-									
3A	1,2-DICHLOROETHANE	-			2.3						
3A	CARBON TETRACHLORIDE	-	43.54	25.6	93	72.1	69	60.6	25.6	93	26.3
3A	1,2-DICHLOROPROPANE	-									
3A	TRICHLOROETHENE	-			2.4						
3A	DIBROMOCHLOROMETHANE	-			2.1						
3A	1,1,2,2-TETRACHLOROETHANE	-			2.1						
3A	CHLOROBENZENE	-			2.4						
3B	METHYLENE CHLORIDE	11.5	9.42	45.9	13.3	10.4	6	17.0	6	45.9	16.4
3B	1,1-DICHLOROETHENE	12.5	6.17	2.4	12.4	9.65	8	7.7	2.4	12.4	3.8
3B	TRANS 1,2-DICHLOROETHENE	6.75	5.81	1.5	8.5	6.4	5	5.4	1.5	8.5	2.6
3B	1,2-DICHLOROETHANE	6.75	4.77	2.1	10	5.4	0	4.5	0	10	3.8
3B	CARBON TETRACHLORIDE	12.5	88.89	24.1	111	78	76	75.6	24.1	111	32.0
3B	1,2-DICHLOROPROPANE	10	7.32	2.8	15.5	9		8.7	2.8	15.5	5.3
3B	TRICHLOROETHENE	12.75	7.94	3	17.2	11.25	11	10.1	3	17.2	5.2
3B	DIBROMOCHLOROMETHANE	7.5	6.08	2.5	11.1	6.7	10	7.3	2.5	11.1	3.4
3B	1,1,2,2-TETRACHLOROETHANE	12.5	7.45	3.7	15.4	12.3	16	11.0	3.7	16	5.3
3B	CHLOROBENZENE	10.25	8.57	2.8	14.7	10.15	9	9.0	2.8	14.7	4.3
3C	METHYLENE CHLORIDE	28.75	21.28	44.4	19.2	25.4	8	23.7	8	44.4	13.3
3C	1,1-DICHLOROETHENE	31.25	9.94	4.3	23.4	21	18	15.3	4.3	23.4	8.0
3C	TRANS 1,2-DICHLOROETHENE	16.875	13.29	4.6	18.8	15.8	12	12.9	4.6	18.8	5.3
3C	1,2-DICHLOROETHANE	16.875	13.89	5.9	21.5	19	0	12.1	0	21.5	9.0
3C	CARBON TETRACHLORIDE	31.25	90.24	37.3	124	80.8	94	85.3	37.3	124	31.3
3C	1,2-DICHLOROPROPANE	25	19.38	8.9	36.1	25.1		22.4	8.9	36.1	11.4
3C	TRICHLOROETHENE	31.875	26.38	9.7	41.8	30.45	33	28.3	9.7	41.8	11.8
3C	DIBROMOCHLOROMETHANE	18.75	17.7	7.7	31.4	21	26	20.8	7.7	31.4	9.0
3C	1,1,2,2-TETRACHLOROETHANE	31.25	21.87	11.9	39.3	37.3	35	29.1	11.9	39.3	11.8
3C	CHLOROBENZENE	25.625	22.27	8.1	34.2	29.45	29	23.4	8.1	34.2	9.9

EFFLUENT 2: 3A - UNSPIKED; 3B - LOW SPIKE; 3C - HIGH SPIKE

TABLE 4 - ROUND ROBIN 88-1: VOLATILES
RESULTS PRESENTED AS PERCENT RECOVERY OF DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7007	7008	MEAN	MIN	MAX
1B	METHYLENE CHLORIDE	9.2	90%	7%	143%	85%	33%	72%	7%	143%
1B	1,1-DICHLOROETHENE	10	62%	16%	119%	93%	80%	74%	16%	119%
1B	TRANS 1,2-DICHLOROETHENE	5.4	92%	24%	104%	105%	74%	80%	24%	105%
1B	1,2-DICHLOROETHANE	5.4	83%	33%	102%	98%	74%	78%	33%	102%
1B	CARBON TETRACHLORIDE	10	67%	24%	140%	93%	90%	83%	24%	140%
1B	1,2-DICHLOROPROPANE	8	74%	30%	111%	90%		76%	30%	111%
1B	TRICHLOROETHENE	10.2	65%	29%	135%	98%	88%	83%	29%	135%
1B	DIBROMOCHLOROMETHANE	6	75%	33%	113%	90%	133%	89%	33%	133%
1B	1,1,2,2-TETRACHLOROETHANE	10	74%	28%	55%	87%	120%	73%	28%	120%
1B	CHLOROBENZENE	8.2	80%	32%	105%	99%	85%	80%	32%	105%
MEAN RECOVERY WITHIN SCAN			76%	26%	113%	94%	86%			
1C	METHYLENE CHLORIDE	23	96%	42%	89%	91%	30%	70%	30%	96%
1C	1,1-DICHLOROETHENE	25	50%	25%	72%	88%	68%	60%	25%	88%
1C	TRANS 1,2-DICHLOROETHENE	13.5	97%	36%	95%	110%	81%	84%	36%	110%
1C	1,2-DICHLOROETHANE	13.5	95%	45%	106%	110%	81%	88%	45%	110%
1C	CARBON TETRACHLORIDE	25	82%	41%	137%	104%	84%	90%	41%	137%
1C	1,2-DICHLOROPROPANE	20	89%	34%	119%	105%		87%	34%	119%
1C	TRICHLOROETHENE	25.5	77%	33%	144%	131%	98%	97%	33%	144%
1C	DIBROMOCHLOROMETHANE	15	100%	43%	127%	109%	133%	103%	43%	133%
1C	1,1,2,2-TETRACHLOROETHANE	25	78%	44%	70%	79%	100%	74%	44%	100%
1C	CHLOROBENZENE	20.5	110%	38%	103%	122%	93%	93%	38%	122%
MEAN RECOVERY WITHIN SCAN			87%	38%	106%	105%	85%			

REAGENT WATER: 1B - LOW SPIKE; 1C - HIGH SPIKE

TABLE 4 - ROUND ROBIN 88-1: VOLATILES
RESULTS PRESENTED AS PERCENT RECOVERY OF DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7007	7008	MEAN	MIN	MAX
2B	METHYLENE CHLORIDE	11.5	97%	20%	86%	95%	9%	61%	9%	97%
2B	1,1-DICHLOROETHENE	12.5	49%	18%	55%	92%	24%	48%	18%	92%
2B	TRANS 1,2-DICHLOROETHENE	6.75	108%	27%	65%	101%	74%	75%	27%	108%
2B	1,2-DICHLOROETHANE	6.75	88%	39%	108%	111%	74%	84%	39%	111%
2B	CARBON TETRACHLORIDE	12.5	68%	27%	120%	96%	80%	78%	27%	120%
2B	1,2-DICHLOROPROPANE	10	73%	33%	125%	96%		82%	33%	125%
2B	TRICHLOROETHENE	12.75	69%	35%	162%	121%	86%	94%	35%	162%
2B	DIBROMOCHLOROMETHANE	7.5	74%	35%	170%	96%	107%	86%	35%	120%
2B	1,1,2,2-TETRACHLOROETHANE	12.5	57%	22%	46%	72%	80%	55%	22%	80%
2B	CHLOROBENZENE	10.25	67%	20%	85%	98%	68%	68%	28%	98%
MEAN RECOVERY WITHIN SCAN			75%	28%	97%	97%	67%			
2C	METHYLENE CHLORIDE	28.75	82%	219%	87%	86%	28%	100%	28%	219%
2C	1,1-DICHLOROETHENE	31.25	48%	20%	103%	76%	54%	60%	20%	103%
2C	TRANS 1,2-DICHLOROETHENE	16.875	65%	24%	139%	95%	65%	78%	24%	139%
2C	1,2-DICHLOROETHANE	16.875	91%	36%	164%	106%	71%	93%	36%	164%
2C	CARBON TETRACHLORIDE	31.25	87%	30%	126%	94%	86%	85%	30%	126%
2C	1,2-DICHLOROPROPANE	25	84%	32%	150%	98%		91%	32%	150%
2C	TRICHLOROETHENE	31.875	92%	33%	178%	124%	94%	104%	33%	178%
2C	DIBROMOCHLOROMETHANE	18.75	94%	36%	179%	106%	133%	110%	36%	179%
2C	1,1,2,2-TETRACHLOROETHANE	31.25	69%	24%	87%	71%	86%	67%	24%	87%
2C	CHLOROBENZENE	25.625	95%	28%	140%	108%	86%	91%	28%	140%
MEAN RECOVERY WITHIN SCAN			81%	48%	135%	96%	78%			

EFFLUENT 1: 2B - LOW SPIKE; 2C - HIGH SPIKE

TABLE 4 - ROUND ROBIN 88-1: VOLATILES
RESULTS PRESENTED AS PERCENT RECOVERY OF DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7007	7008	MEAN	MIN	MAX
3B	METHYLENE CHLORIDE	11.5	64%	61%	38%	80%	9%	50%	9%	80%
3B	1,1-DICHLOROETHENE	12.5	49%	19%	38%	77%	64%	50%	19%	77%
3B	TRANS 1,2-DICHLOROETHENE	6.75	86%	22%	126%	95%	74%	81%	22%	126%
3B	1,2-DICHLOROETHANE	6.75	71%	31%	114%	80%	0%	59%	0%	114%
3B	CARBON TETRACHLORIDE	12.5	363%	-12%	144%	47%	56%	120%	-12%	363%
3B	1,2-DICHLOROPROPANE	10	79%	28%	155%	90%		87%	28%	155%
3B	TRICHLOROETHENE	12.75	62%	24%	116%	88%	86%	75%	24%	116%
3B	DIBROMOCHLOROMETHANE	7.5	81%	33%	120%	89%	133%	91%	33%	133%
3B	1,1,2,2-TETRACHLOROETHANE	12.5	60%	30%	106%	98%	128%	84%	30%	128%
3B	CHLOROBENZENE	10.25	84%	27%	120%	99%	88%	84%	27%	120%
MEAN RECOVERY WITHIN SCAN			99%	26%	108%	84%	71%			
3C	METHYLENE CHLORIDE	28.75	67%	19%	36%	84%	10%	43%	10%	84%
3C	1,1-DICHLOROETHENE	31.25	32%	14%	51%	67%	58%	44%	14%	67%
3C	TRANS 1,2-DICHLOROETHENE	16.875	79%	27%	111%	94%	71%	76%	27%	111%
3C	1,2-DICHLOROETHANE	16.875	82%	35%	114%	113%	0%	69%	0%	114%
3C	CARBON TETRACHLORIDE	31.25	149%	37%	99%	28%	80%	79%	28%	149%
3C	1,2-DICHLOROPROPANE	25	77%	36%	144%	100%		89%	36%	144%
3C	TRICHLOROETHENE	31.875	83%	30%	124%	96%	104%	87%	30%	124%
3C	DIBROMOCHLOROMETHANE	18.75	94%	41%	156%	112%	139%	108%	41%	156%
3C	1,1,2,2-TETRACHLOROETHANE	31.25	70%	38%	119%	119%	112%	92%	38%	119%
3C	CHLOROBENZENE	25.625	87%	32%	124%	115%	90%	89%	32%	124%
MEAN RECOVERY WITHIN SCAN			82%	31%	108%	93%	74%			

EFFLUENT 2: 3B - LOW SPIKE; 3C - HIGH SPIKE

TABLE 5 - ROUND ROBIN 88-1 RESULTS: EXTRACTABLES SAMPLES 1A - 1C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX	S.D.
1A	ACENAPHTHENE	-								
1A	ANTHRACENE	-								
1A	BENZO(A)ANTHRACENE	-								
1A	BIS(2-CHLOROETHOXY)METHANE	-								
1A	CHRYSENE	-								
1A	DIBENZO(A,H)ANTHRACENE	-								
1A	1,2-DICHLOROBENZENE	-								
1A	1,3-DICHLOROBENZENE	-								
1A	DIETHYLPHTHALATE	-								
1A	2,4-DINITROTOLUENE	-								
1A	FLUORENE	-								
1A	HEXACHLOROBENZENE	-								
1A	HEXACHLOROBUTADIENE	-								
1A	NAPHTHALENE	-								
1A	PYRENE	-								
1A	2-CHLOROPHENOL	-								
1A	2-NITROPHENOL	-								
1A	PHENOL	-								
1A	2,4-DIMETHYLPHENOL	-								
1A	2,4-DICHLOROPHENOL	-								
1A	2,4,6-TRICHLOROPHENOL	-								
1A	4-CHLORO-3-METHYLPHENOL	-								
1A	2-METHYL-4,6-DINITROPHENOL	-								
1A	PENTACHLOROPHENOL	-								
1A	4-NITROPHENOL	-								
1B	ACENAPHTHENE	5	4.51	3	4.2	4.3	4.0	3	4.51	0.7
1B	ANTHRACENE	5	4.05	2.8	4.2	5	4.0	2.8	5	0.9
1B	BENZO(A)ANTHRACENE	5	4.89	2.9	2.9	5.2	4.0	2.9	5.2	1.2
1B	BIS(2-CHLOROETHOXY)METHANE	5	5.46	4.1	4	5.8	4.8	4	5.8	0.9
1B	CHRYSENE	5	4.5	2.8	3.2	3.8	3.6	2.8	4.5	0.7
1B	DIBENZO(A,H)ANTHRACENE	5	0	1.8	2.1	0.9	1.2	0	2.1	0.9
1B	1,2-DICHLOROBENZENE	5	4.94	3.4	4.2		4.2	3.4	4.94	0.8
1B	1,3-DICHLOROBENZENE	5	5.39	3.6	3.8		4.3	3.6	5.39	1.0
1B	DIETHYLPHTHALATE	5	3.97	2.9	3.1		3.3	2.9	3.97	0.6
1B	2,4-DINITROTOLUENE	5	3.8	2.8	3.5	2.3	3.1	2.3	3.8	0.7
1B	FLUORENE	5	4.29	3	4.2	3.5	3.7	3	4.29	0.6
1B	HEXACHLOROBENZENE	5	5.15	3.4			4.3	3.4	5.15	1.2
1B	HEXACHLOROBUTADIENE	5	5.46	3.3	3.8		4.2	3.3	5.46	1.1
1B	NAPHTHALENE	5	6.11	3.3	3.7	3.6	4.2	3.3	6.11	1.3
1B	PYRENE	5	4.03	3	4.7	4.5	4.1	3	4.7	0.8
1B	2-CHLOROPHENOL	12.5	10.8	6.4	9.1	15.5	10.5	6.4	15.5	3.8
1B	2-NITROPHENOL	12.5	12.5	9.5	10.1		10.7	9.5	12.5	1.6
1B	PHENOL	12.5	15.8	4.1	5.6	10.8	9.1	4.1	15.8	5.3
1B	2,4-DIMETHYLPHENOL	12.5	5.9	0.5	0	24.3	7.7	0	24.3	11.4
1B	2,4-DICHLOROPHENOL	12.5	15.7	5.9	9.3	7.2	9.5	5.9	15.7	4.3
1B	2,4,6-TRICHLOROPHENOL	12.5	11	6.5	14.9	10.1	10.6	6.5	14.9	3.5
1B	4-CHLORO-3-METHYLPHENOL	12.5	9.18	5.3	7.6	12.2	8.6	5.3	12.2	2.9
1B	2-METHYL-4,6-DINITROPHENOL	12.5	0	0	11.6		3.9	0	11.6	6.7
1B	PENTACHLOROPHENOL	12.5	4.5	7.9	8.8	8.8	7.5	4.5	8.8	2.0
1B	4-NITROPHENOL	12.5	0	0	1.3	5.6	1.7	0	5.6	2.7

TABLE 5 - ROUND ROBIN 88-1 RESULTS: EXTRACTABLES SAMPLES 1A - 1C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX	S.D.
1C	ACENAPHTHENE	17.5	18.5	12	15.5	14.3	15.1	12	18.5	2.7
1C	ANTHRACENE	17.5	16.1	11.9	15.3	15.1	14.6	11.9	16.1	1.9
1C	BENZO(A)ANTHRACENE	17.5	18.8	13.3	20.6	15.5	17.1	13.3	20.6	3.3
1C	BIS(2-CHLOROETHOXY)METHANE	17.5	20.4	16.8	15	14.4	16.7	14.4	20.4	2.7
1C	CHRYSENE	17.5	16.6	13.1	20.6	11	15.3	11	20.6	4.2
1C	DIBENZO(A,H)ANTHRACENE	17.5	10.9	7.5	11	6.4	9.0	6.4	11	2.4
1C	1,2-DICHLOROBENZENE	17.5	18.5	13	12.3		14.6	12.3	18.5	3.4
1C	1,3-DICHLOROBENZENE	17.5	18.8	13.5	10.9		14.4	10.9	18.8	4.0
1C	DIETHYLPHTHALATE	17.5	16.9	12.1	6.2		11.7	6.2	16.9	5.4
1C	2,4-DINITROTOLUENE	17.5	17.9	13.5	14	9.8	12.8	9.8	14	2.0
1C	FLUORENE	17.5	18.4	12	14.7	11.5	14.2	11.5	18.4	3.2
1C	HEXACHLOROBENZENE	17.5	19.1	15.9			17.5	15.9	19.1	2.3
1C	HEXACHLOROBUTADIENE	17.5	18	13.5	9.8		13.4	9.8	18	4.2
1C	NAPHTHALENE	17.5	26	12.6	14.1	11.9	16.2	11.9	26	6.6
1C	PYRENE	17.5	15.37	13.9	19.1	14.5	15.8	13.9	19.1	2.3

TABLE 6 - ROUND ROBIN 88-1 RESULTS: EXTRACTABLES SAMPLES 2A - 2C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX	S.D.
2A	ACENAPHTHENE	-								
2A	ANTHRACENE	-								
2A	BENZO(A)ANTHRACENE	-								
2A	BIS(2-CHLOROETHOXY)METHANE	-								
2A	CHRYSENE	-								
2A	DIBENZO(A,H)ANTHRACENE	-								
2A	1,2-DICHLOROBENZENE	-								
2A	1,3-DICHLOROBENZENE	-								
2A	DIETHYLPHTHALATE	-								
2A	2,4-DINITROTOLUENE	-								
2A	FLUORENE	-								
2A	HEXACHLOROBENZENE	-								
2A	HEXACHLOROBUTADIENE	-								
2A	NAPHTHALENE	-								
2A	PYRENE	-								
2A	2-CHLOROPHENOL	-								
2A	2-NITROPHENOL	-								
2A	PHENOL	-								
2A	2,4-DIMETHYLPHENOL	-								
2A	2,4-DICHLOROPHENOL	-								
2A	2,4,6-TRICHLOROPHENOL	-								
2A	4-CHLORO-3-METHYLPHENOL	-								
2A	2-METHYL-4,6-DINITROPHENOL	-								
2A	PENTACHLOROPHENOL	-								
2A	4-NITROPHENOL	-								
2B	ACENAPHTHENE	10	5.41	8	5.9	7	6.6	5.41	8	1.2
2B	ANTHRACENE	10	6.92	6.3	5.9	8.8	7.0	5.9	8.8	1.3
2B	BENZO(A)ANTHRACENE	10	7.07	9.2	7.7	10.3	8.6	7.07	10.3	1.5
2B	BIS(2-CHLOROETHOXY)METHANE	10	6.55	11.6	5.6	9.3	8.3	5.6	11.6	2.7
2B	CHRYSENE	10	7.11	9.1	9	8.1	8.3	7.11	9.1	0.9
2B	DIBENZO(A,H)ANTHRACENE	10	5.28	4	5.8	3.1	4.5	3.1	5.8	1.2
2B	1,2-DICHLOROBENZENE	10	1.85	8.1	3.1		4.4	1.85	8.1	3.3
2B	1,3-DICHLOROBENZENE	10	2.13	8.9	2.7		4.6	2.13	8.9	3.8
2B	DIETHYLPHTHALATE	10	8.8	8.4	2.8		6.7	2.8	8.8	3.4
2B	2,4-DINITROTOLUENE	10	2.81	6	2.1	2.8	3.4	2.1	6	1.7
2B	FLUORENE	10	5.35	7.7	5.7	5.4	6.0	5.35	7.7	1.1
2B	HEXACHLOROBENZENE	10	8.11	13.7			10.9	8.11	13.7	4.0
2B	HEXACHLOROBUTADIENE	10	2.86	7.9	4.1		5.0	2.86	7.9	2.6
2B	NAPHTHALENE	10	2.56	5.2	2.8	3.6	3.5	2.56	5.2	1.2
2B	PYRENE	10	7.82	11.2	8.6	8.6	9.1	7.82	11.2	1.5
2B	2-CHLOROPHENOL	17.5	6.42	9.5	3.5	15.7	8.8	3.5	15.7	5.2
2B	2-NITROPHENOL	17.5	7.08	19	7.1		11.1	7.08	19	6.9
2B	PHENOL	17.5	0	0	0	0	0.0	0	0	0.0
2B	2,4-DIMETHYLPHENOL	17.5	8.86	0.6	0	34	10.9	0	34	15.9
2B	2,4-DICHLOROPHENOL	17.5	9.82	11.5	8.8	9.9	10.0	8.8	11.5	1.1
2B	2,4,6-TRICHLOROPHENOL	17.5	11.63	14.8	13.5	14	13.5	11.63	14.8	1.3
2B	4-CHLORO-3-METHYLPHENOL	17.5	9.95	9.7	8.4	14.7	10.7	8.4	14.7	2.8
2B	2-METHYL-4,6-DINITROPHENOL	17.5	8.16	30.6	12.4		17.1	8.16	30.6	11.9
2B	PENTACHLOROPHENOL	17.5	0.88	76.8	6.6	12.3	24.1	0.88	76.8	35.4
2B	4-NITROPHENOL	17.5	0	19	3.2	0	5.6	0	19	9.1

TABLE 6 - ROUND ROBIN 88-1 RESULTS: EXTRACTABLES SAMPLES 2A - 2C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX	S.D.
2C	ACENAPHTHENE	21.25	18.1	16.5	14.4	15.1	16.0	14.4	18.1	1.6
2C	ANTHRACENE	21.25	16.3	13.9	15	17.9	15.8	13.9	17.9	1.7
2C	BENZO(A)ANTHRACENE	21.25	21.4	14.1	20.8	14.5	17.7	14.1	21.4	3.9
2C	BIS(2-CHLOROETHOXY)METHANE	21.25	18	24.4	13.8	20	19.1	13.8	24.4	4.4
2C	CHRYSENE	21.25	19	14.3	24.3	10.8	17.1	10.8	24.3	5.9
2C	DIBENZO(A,H)ANTHRACENE	21.25	14.4	9.3	12.4	2.7	9.7	2.7	14.4	5.1
2C	1,2-DICHLOROBENZENE	21.25	16.9	18.8	10.4		15.4	10.4	18.8	4.4
2C	1,3-DICHLOROBENZENE	21.25	18.7	20	9.6		16.1	9.6	20	5.7
2C	DIETHYLPHTHALATE	21.25	19.6	15.8	6.5		14.0	6.5	19.6	6.7
2C	2,4-DINITROTOLUENE	21.25	6.8	16.6	7.7	16.8	12.0	6.8	16.8	5.5
2C	FLUORENE	21.25	17.1	14.8	14.2	12.1	14.6	12.1	17.1	2.1
2C	HEXACHLOROBENZENE	21.25	7.3	17.3			12.3	7.3	17.3	7.1
2C	HEXACHLOROBUTADIENE	21.25	13	17.1	11.3		13.8	11.3	17.1	3.0
2C	NAPHTHALENE	21.25	19.3	13.3	9.3	9.5	12.9	9.3	19.3	4.7
2C	PYRENE	21.25	18.2	15	20.2	14.8	17.1	14.8	20.2	2.6
2C	2-CHLOROPHENOL	18.75	9.47	11.6	9.4	19.6	12.5	9.4	19.6	4.8
2C	2-NITROPHENOL	18.75	13.1	21.9	11		15.3	11	21.9	5.8
2C	PHENOL	18.75	0	1.1	0.4	2	0.9	0	2	0.9
2C	2,4-DIMETHYLPHENOL	18.75	11.5	1.1	0	37.3	12.5	0	37.3	17.3
2C	2,4-DICHLOROPHENOL	18.75	12	12.3	11.5	10.5	11.6	10.5	12.3	0.8
2C	2,4,6-TRICHLOROPHENOL	56.25	47.4	40.3	45.9	38.6	43.1	38.6	47.4	4.3
2C	4-CHLORO-3-METHYLPHENOL	93.75	72	51.1	51.9	62.1	59.3	51.1	72	9.9
2C	2-METHYL-4,6-DINITROPHENOL	93.75	39.5	112.5	86.1		79.4	39.5	112.5	37.0
2C	PENTACHLOROPHENOL	93.75	13.7	209.4	39.1	39.8	75.5	13.7	209.4	90.1
2C	4-NITROPHENOL	93.75	13.1	50.3	15.4	38.6	29.4	13.1	50.3	18.1
2C	2,4-DINITROPHENOL	56.25			33.9					

EFFLUENT 1: 2A - UNSPIKED; 2B - LOW SPIKE; 2C - HIGH SPIKE

TABLE 7 - ROUND ROBIN 88-1 RESULTS: EXTRACTABLES SAMPLES 3A - 3C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX	S.D.
3A	ACENAPHTHENE	-								
3A	ANTHRACENE	-								
3A	BENZO(A)ANTHRACENE	-								
3A	BIS(2-CHLOROETHOXY)METHANE	-								
3A	CHRYSENE	-								
3A	DIBENZO(A,H)ANTHRACENE	-								
3A	1,2-DICHLOROBENZENE	-								
3A	1,3-DICHLOROBENZENE	-								
3A	DIETHYLPHTHALATE	-								
3A	2,4-DINITROTOLUENE	-								
3A	FLUORENE	-								
3A	HEXACHLOROBENZENE	-								
3A	HEXACHLOROBUTADIENE	-								
3A	NAPHTHALENE	-								
3A	PYRENE	-								
3A	2-CHLOROPHENOL	-								
3A	2-NITROPHENOL	-								
3A	PHENOL	-		0.9						
3A	2,4-DIMETHYLPHENOL	-								
3A	2,4-DICHLOROPHENOL	-								
3A	2,4,6-TRICHLOROPHENOL	-								
3A	4-CHLORO-3-METHYLPHENOL	-								
3A	2-METHYL-4,6-DINITROPHENOL	-								
3A	PENTACHLOROPHENOL	-								
3A	4-NITROPHENOL	-								
3B	ACENAPHTHENE	10	5.46	10	5.3	8.2	7.2	5.3	10	2.3
3B	ANTHRACENE	10	10	4.7	6.2	9.7	7.7	4.7	10	2.6
3B	BENZO(A)ANTHRACENE	10	10.8	7.1	8.4	9.6	9.0	7.1	10.8	1.6
3B	BIS(2-CHLOROETHOXY)METHANE	10	3.32	13.5	4.2	10.5	7.9	3.32	13.5	4.9
3B	CHRYSENE	10	10.1	7.6	9.9	6.4	8.5	6.4	10.1	1.8
3B	DIBENZO(A,H)ANTHRACENE	10	6.73	2.4	6.1	2.5	4.4	2.4	6.73	2.3
3B	1,2-DICHLOROBENZENE	10	1.88	10.2	3.3		5.1	1.88	10.2	4.5
3B	1,3-DICHLOROBENZENE	10	1.84	10.6	3		5.1	1.84	10.6	4.8
3B	DIETHYLPHTHALATE	10	8.92	9.5	3		7.1	3	9.5	3.6
3B	2,4-DINITROTOLUENE	10	11.8	13.7	5.9	9	10.1	5.9	13.7	3.4
3B	FLUORENE	10	7.03	10	6.2	7.1	7.6	6.2	10	1.7
3B	HEXACHLOROBENZENE	10	0	13.4			6.7	0	13.4	9.5
3B	HEXACHLOROBUTADIENE	10	3.79	10	4.3		6.0	3.79	10	3.4
3B	NAPHTHALENE	10	3.36	10.1	4	7.3	6.2	3.36	10.1	3.1
3B	PYRENE	10	11	10	6.7	8.9	9.2	6.7	11	1.8
3B	2-CHLOROPHENOL	17.5	5.14	15.5	6.3	6.9	8.5	5.14	15.5	4.7
3B	2-NITROPHENOL	17.5	7.31	24.9	6.1		12.8	6.1	24.9	10.5
3B	PHENOL	17.5	4.84	10.2	4.7	5	6.2	4.7	10.2	2.7
3B	2,4-DIMETHYLPHENOL	17.5	7.1	8.1	9	3.1	6.8	3.1	9	2.6
3B	2,4-DICHLOROPHENOL	17.5	7.84	17.3	9.9	3.2	9.6	3.2	17.3	5.9
3B	2,4,6-TRICHLOROPHENOL	17.5	17	18.9	13.8	5.5	13.8	5.5	18.9	5.9
3B	4-CHLORO-3-METHYLPHENOL	17.5	15.8	17.8	11.5	4.1	12.3	4.1	17.8	6.1
3B	2-METHYL-4,6-DINITROPHENOL	17.5	17.9	61.4	16.4		31.9	16.4	61.4	25.6
3B	PENTACHLOROPHENOL	17.5	10.1	99.6	12.4	3.3	31.4	3.3	99.6	45.7
3B	4-NITROPHENOL	17.5	9.56	20.9	4.6	5.4	10.1	4.6	20.9	7.5

TABLE 7 - ROUND ROBIN 88-1 RESULTS: EXTRACTABLES SAMPLES 3A - 3C
RESULTS REPORTED AS ppb

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX	S.D.
3C	ACENAPHTHENE	21.25	10.5	16	15.3	11.6	13.4	10.5	16	2.7
3C	ANTHRACENE	21.25	19.5	12.3	16.5	14.4	15.7	12.3	19.5	3.1
3C	BENZO(A)ANTHRACENE	21.25	24.8	14.1	12.9	14.3	16.5	12.9	24.8	5.6
3C	BIS(2-CHLOROETHOXY)METHANE	21.25	6.56	23	13.1	15	14.4	6.56	23	6.8
3C	CHRYSENE	21.25	23	14.5	15.2	10.2	15.7	10.2	23	5.3
3C	DIBENZO(A,H)ANTHRACENE	21.25	8.5	14.1	7.4	4.9	8.7	4.9	14.1	3.9
3C	1,2-DICHLOROBENZENE	21.25	5.52	21.1	9.4		12.0	5.52	21.1	8.1
3C	1,3-DICHLOROBENZENE	21.25	5.70	22	7.4		11.7	5.78	22	8.9
3C	DIETHYLPHTHALATE	21.25	20.6	15.1	6.5		14.1	6.5	20.6	7.1
3C	2,4-DINITROTOLUENE	21.25	26	22	14.7	14.7	19.4	14.7	26	5.6
3C	FLUORENE	21.25	13.9	16.5	17.4	9.8	14.4	9.8	17.4	3.4
3C	HEXACHLOROBENZENE	21.25	0	20.9			10.5	0	20.9	14.8
3C	HEXACHLOROBUTADIENE	21.25	6.63	18	10.2		11.6	6.63	18	5.8
3C	NAPHTHALENE	21.25	11.9	19	12.5	9.7	13.3	9.7	19	4.0
3C	PYRENE	21.25	22.1	16.8	15.9	12.9	16.9	12.9	22.1	3.8
3C	2-CHLOROPHENOL	18.75	4.66	14.4	9.3	6.3	8.7	4.66	14.4	4.3
3C	2-NITROPHENOL	18.75	5.67	21.3	9.5		12.2	5.67	21.3	8.1
3C	PHENOL	18.75	4.29	10.1	6.7	5	6.5	4.29	10.1	2.6
3C	2,4-DIMETHYLPHENOL	18.75	4.66	10.5	12.5	2.6	7.6	2.6	12.5	4.7
3C	2,4-DICHLOROPHENOL	18.75	8.48	14.8	12.8	2.9	9.7	2.9	14.8	5.3
3C	2,4,6-TRICHLOROPHENOL	56.25	50.1	44.5	49.6	12.3	39.1	12.3	50.1	18.1
3C	4-CHLORO-3-METHYLPHENOL	93.75	69.3	68.4	69.4	16.3	55.9	16.3	69.4	26.4
3C	2-METHYL-4,6-DINITROPHENOL	93.75	94.2	117.9	82.9		98.3	82.9	117.9	17.9
3C	PENTACHLOROPHENOL	93.75	133	174.5	52.8	8.2	92.1	8.2	174.5	75.4
3C	4-NITROPHENOL	93.75	56.2	65.8	20.8	33.2	44.0	20.8	65.8	20.6
3C	2,4-DINITROPHENOL	56.25			36.3					

EFFLUENT 2: 3A - UNSPIKED; 3B - LOW SPIKE; 3C - HIGH SPIKE

TABLE 8 - ROUND ROBIN 88-1 RESULTS: BASE/NEUTRAL AND ACID EXTRACTABLES
RESULTS EXPRESSED AS PERCENT RECOVERY OF THE DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX
1B	ACENAPHTHENE	5	90%	60%	84%	86%	80%	60%	90%
1B	ANTHRACENE	5	81%	56%	84%	100%	80%	56%	100%
1B	BENZO(A)ANTHRACENE	5	98%	58%	58%	104%	79%	58%	104%
1B	BIS(2-CHLOROETHOXY)METHANE	5	109%	82%	80%	116%	97%	80%	116%
1B	CHRYSENE	5	90%	56%	64%	76%	72%	56%	90%
1B	DIBENZO(A,H)ANTHRACENE	5	0%	36%	42%	18%	24%	0%	42%
1B	1,2-DICHLOROBENZENE	5	99%	68%	84%		84%	68%	99%
1B	1,3-DICHLOROBENZENE	5	108%	72%	76%		85%	72%	108%
1B	DIETHYLPHTHALATE	5	79%	58%	62%		66%	58%	79%
1B	2,4-DINITROTOLUENE	5	76%	56%	70%	46%	62%	46%	76%
1B	FLUORENE	5	86%	60%	84%	70%	75%	60%	86%
1B	HEXACHLOROBENZENE	5	103%	68%			86%	68%	103%
1B	HEXACHLOROBUTADIENE	5	109%	66%	76%		84%	66%	109%
1B	NAPHTHALENE	5	122%	66%	74%	72%	84%	66%	122%
1B	PYRENE	5	81%	60%	94%	90%	81%	60%	94%
MEAN RECOVERY WITHIN SCAN			89%	61%	74%	78%			
1B	2-CHLOROPHENOL	12.5	86%	51%	73%	124%	84%	51%	124%
1B	2-NITROPHENOL	12.5	100%	76%	81%		86%	76%	100%
1B	PHENOL	12.5	126%	33%	45%	86%	73%	33%	126%
1B	2,4-DIMETHYLPHENOL	12.5	47%	4%	0%	194%	61%	0%	194%
1B	2,4-DICHLOROPHENOL	12.5	126%	47%	74%	62%	77%	47%	126%
1B	2,4,6-TRICHLOROPHENOL	12.5	88%	52%	119%	81%	85%	52%	119%
1B	4-CHLORO-3-METHYLPHENOL	12.5	73%	42%	61%	98%	69%	42%	98%
1B	2-METHYL-4,6-DINITROPHENOL	12.5	0%	0%	93%		31%	0%	93%
1B	PENTACHLOROPHENOL	12.5	36%	63%	70%	70%	60%	36%	70%
1B	4-NITROPHENOL	12.5	0%	0%	10%	45%	14%	0%	45%
MEAN RECOVERY WITHIN SCAN			68%	37%	63%	95%			
1C	ACENAPHTHENE	17.5	106%	69%	89%	82%	86%	69%	106%
1C	ANTHRACENE	17.5	92%	68%	87%	86%	83%	68%	92%
1C	BENZO(A)ANTHRACENE	17.5	107%	76%	118%	89%	97%	76%	118%
1C	BIS(2-CHLOROETHOXY)METHANE	17.5	117%	96%	86%	111%	102%	86%	117%
1C	CHRYSENE	17.5	95%	75%	118%	63%	88%	63%	118%
1C	DIBENZO(A,H)ANTHRACENE	17.5	62%	43%	63%	37%	51%	37%	63%
1C	1,2-DICHLOROBENZENE	17.5	106%	74%	70%		83%	70%	106%
1C	1,3-DICHLOROBENZENE	17.5	107%	77%	62%		82%	62%	107%
1C	DIETHYLPHTHALATE	17.5	97%	69%	35%		67%	35%	97%
1C	2,4-DINITROTOLUENE	17.5	79%	77%	80%	56%	73%	56%	80%
1C	FLUORENE	17.5	105%	69%	84%	66%	81%	66%	105%
1C	HEXACHLOROBENZENE	17.5	109%	91%			100%	91%	109%
1C	HEXACHLOROBUTADIENE	17.5	103%	71%	56%		77%	56%	103%
1C	NAPHTHALENE	17.5	149%	72%	81%	68%	92%	68%	149%
1C	PYRENE	17.5	89%	79%	109%	83%	90%	79%	109%
MEAN RECOVERY WITHIN SCAN			102%	74%	81%	74%			

NOTE: 1C DID NOT CONTAIN ANY PHENOLS
REAGENT WATER: 1B - LOW SPIKE; 1C - HIGH SPIKE

TABLE 8 - ROUND ROBIN 88-1 RESULTS: BASE/NEUTRAL AND ACID EXTRACTABLES
RESULTS EXPRESSED AS PERCENT RECOVERY OF THE DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX
2B	ACENAPHTHENE	10	54%	80%	59%	70%	66%	54%	80%
2B	ANTHRACENE	10	69%	63%	59%	88%	70%	59%	88%
2B	BENZO(A)ANTHRACENE	10	71%	92%	77%	103%	86%	71%	103%
2B	BIS(2-CHLOROETHOXY)METHANE	10	66%	116%	56%	93%	83%	56%	116%
2B	CHRYSENE	10	71%	91%	90%	81%	83%	71%	91%
2B	DIBENZO(A,H)ANTHRACENE	10	53%	40%	58%	31%	45%	31%	58%
2B	1,2-DICHLOROBENZENE	10	19%	81%	31%		44%	19%	81%
2B	1,3-DICHLOROBENZENE	10	21%	89%	27%		46%	21%	89%
2B	DIETHYLPHTHALATE	10	88%	84%	28%		67%	28%	88%
2B	2,4-DINITROTOLUENE	10	28%	60%	21%	28%	34%	21%	60%
2B	FLUORENE	10	58%	77%	57%	54%	60%	53%	77%
2B	HEXACHLOROBENZENE	10	81%	137%			109%	81%	137%
2B	HEXACHLOROBUTADIENE	10	29%	79%	41%		50%	29%	79%
2B	NAPHTHALENE	10	26%	52%	28%	36%	35%	26%	52%
2B	PYRENE	10	78%	112%	86%	86%	91%	78%	112%
MEAN RECOVERY WITHIN SCAN			54%	84%	51%	67%			
2B	2-CHLOROPHENOL	17.5	37%	54%	20%	90%	50%	20%	90%
2B	2-NITROPHENOL	17.5	40%	109%	41%		63%	40%	109%
2B	PHENOL	17.5	0%	0%	0%	0%	0%	0%	0%
2B	2,4-DIMETHYLPHENOL	17.5	51%	3%	0%	194%	62%	0%	194%
2B	2,4-DICHLOROPHENOL	17.5	56%	66%	50%	57%	57%	50%	66%
2B	2,4,6-TRICHLOROPHENOL	17.5	66%	85%	77%	80%	77%	66%	85%
2B	4-CHLORO-3-METHYLPHENOL	17.5	57%	55%	48%	84%	61%	48%	84%
2B	2-METHYL-4,6-DINITROPHENOL	17.5	47%	175%	71%		97%	47%	175%
2B	PENTACHLOROPHENOL	17.5	5%	439%	38%	70%	138%	5%	439%
2B	4-NITROPHENOL	17.5	0%	109%	18%	0%	32%	0%	109%
MEAN RECOVERY WITHIN SCAN			36%	109%	36%	72%			

EFFLUENT 1: 2B - LOW SPIKE; 2C - HIGH SPIKE

TABLE 8 - ROUND ROBIN 88-1 RESULTS: BASE/NEUTRAL AND ACID EXTRACTABLES
RESULTS EXPRESSED AS PERCENT RECOVERY OF THE DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX
2C	ACENAPHTHENE	21.25	85%	78%	68%	71%	75%	68%	85%
2C	ANTHRACENE	21.25	77%	65%	71%	84%	74%	65%	84%
2C	BENZO(A)ANTHRACENE	21.25	101%	66%	98%	68%	83%	66%	101%
2C	BIS(2-CHLOROETHOXY)METHANE	21.25	85%	115%	65%	94%	90%	65%	115%
2C	CHRYSENE	21.25	89%	67%	114%	51%	80%	51%	114%
2C	DIBENZO(A,H)ANTHRACENE	21.25	68%	44%	58%	13%	46%	13%	68%
2C	1,2-DICHLOROBENZENE	21.25	80%	88%	49%		72%	49%	88%
2C	1,3-DICHLOROBENZENE	21.25	88%	94%	45%		76%	45%	94%
2C	DIETHYLPHTHALATE	21.25	92%	74%	31%		66%	31%	92%
2C	2,4-DINITROTOLUENE	21.25	32%	78%	36%	79%	56%	32%	79%
2C	FLUORENE	21.25	80%	70%	67%	57%	68%	57%	80%
2C	HEXACHLOROBENZENE	21.25	34%	81%			58%	34%	81%
2C	HEXACHLOROBUTADIENE	21.25	61%	80%	53%		65%	53%	80%
2C	NAPHTHALENE	21.25	91%	63%	44%	45%	60%	44%	91%
2C	PYRENE	21.25	86%	71%	95%	70%	80%	70%	95%
MEAN RECOVERY WITHIN SCAN			77%	76%	64%	63%			
2C	2-CHLOROPHENOL	18.75	51%	62%	50%	105%	67%	50%	105%
2C	2-NITROPHENOL	18.75	70%	117%	59%		82%	59%	117%
2C	PHENOL	18.75	0%	6%	2%	11%	5%	0%	11%
2C	2,4-DIMETHYLPHENOL	18.75	61%	6%	0%	200%	67%	0%	200%
2C	2,4-DICHLOROPHENOL	18.75	64%	66%	61%	56%	62%	56%	66%
2C	2,4,6-TRICHLOROPHENOL	56.25	84%	72%	82%	69%	77%	69%	84%
2C	4-CHLORO-3-METHYLPHENOL	93.75	77%	55%	55%	66%	63%	55%	77%
2C	2-METHYL-4,6-DINITROPHENOL	93.75	42%	120%	92%		85%	42%	120%
2C	PENTACHLOROPHENOL	93.75	15%	229%	42%	42%	81%	15%	229%
2C	4-NITROPHENOL	93.75	14%	54%	16%	41%	31%	14%	54%
2C	2,4-DINITROPHENOL	56.25			60%		60%	60%	60%
MEAN RECOVERY WITHIN SCAN			48%	78%	47%	74%			

EFFLUENT 1: 2B - LOW SPIKE; 2C - HIGH SPIKE

TABLE 8 - ROUND ROBIN 88-1 RESULTS: BASE/NEUTRAL AND ACID EXTRACTABLES
RESULTS EXPRESSED AS PERCENT RECOVERY OF THE DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX
3B	ACENAPHTHENE	10	55%	100%	53%	82%	72%	53%	100%
3B	ANTHRACENE	10	100%	47%	62%	97%	77%	47%	100%
3B	BENZO(A)ANTHRACENE	10	108%	71%	84%	96%	90%	71%	108%
3B	BIS(2-CHLOROETHOXY)METHANE	10	33%	135%	42%	105%	79%	33%	135%
3B	CHRYSENE	10	101%	76%	99%	64%	85%	64%	101%
3B	DIBENZO(A,H)ANTHRACENE	10	67%	24%	61%	25%	44%	24%	67%
3B	1,2-DICHLOROBENZENE	10	19%	102%	33%		51%	19%	102%
3B	1,3-DICHLOROBENZENE	10	18%	106%	30%		51%	18%	106%
3B	DIETHYLPHTHALATE	10	89%	95%	30%		71%	30%	95%
3B	2,4-DINITROTOLUENE	10	118%	137%	59%	90%	101%	59%	137%
3B	FLUORENE	10	70%	100%	60%	71%	76%	62%	100%
3B	HEXACHLOROBENZENE	10	0%	134%			67%	0%	134%
3B	HEXACHLOROBUTADIENE	10	38%	100%	43%		60%	38%	100%
3B	NAPHTHALENE	10	34%	101%	40%	73%	62%	34%	101%
3B	PYRENE	10	110%	100%	67%	89%	92%	67%	110%
MEAN RECOVERY WITHIN SCAN			64%	95%	55%	79%			
3B	2-CHLOROPHENOL	17.5	29%	89%	36%	39%	48%	29%	89%
3B	2-NITROPHENOL	17.5	42%	142%	35%		73%	35%	142%
3B	PHENOL	17.5	28%	58%	27%	29%	35%	27%	58%
3B	2,4-DIMETHYLPHENOL	17.5	41%	46%	51%	18%	39%	18%	51%
3B	2,4-DICHLOROPHENOL	17.5	45%	99%	57%	18%	55%	18%	99%
3B	2,4,6-TRICHLOROPHENOL	17.5	97%	108%	79%	31%	79%	31%	108%
3B	4-CHLORO-3-METHYLPHENOL	17.5	90%	102%	66%	23%	70%	23%	102%
3B	2-METHYL-4,6-DINITROPHENOL	17.5	102%	351%	94%		182%	94%	351%
3B	PENTACHLOROPHENOL	17.5	58%	569%	71%	19%	179%	19%	569%
3B	4-NITROPHENOL	17.5	55%	119%	26%	31%	58%	26%	119%
MEAN RECOVERY WITHIN SCAN			59%	168%	54%	26%			

EFFLUENT 2: 3B - LOW SPIKE; 3C - HIGH SPIKE

TABLE 8 - ROUND ROBIN 88-1 RESULTS: BASE/NEUTRAL AND ACID EXTRACTABLES
RESULTS EXPRESSED AS PERCENT RECOVERY OF THE DESIGN VALUE

SUBMITTED: JUNE 20, 1988

SAMPLE	PARAMETER	DESIGN	LAB NUMBER 7002	7003	7005	7008	MEAN	MIN	MAX
3C	ACENAPHTHENE	21.25	49%	75%	72%	55%	63%	49%	75%
3C	ANTHRACENE	21.25	92%	58%	78%	68%	74%	58%	92%
3C	BENZO(A)ANTHRACENE	21.25	117%	66%	61%	67%	78%	61%	117%
3C	BIS(2-CHLOROETHOXY)METHANE	21.25	31%	108%	62%	71%	68%	31%	108%
3C	CHRYSENE	21.25	108%	68%	72%	6%	63%	6%	108%
3C	DIBENZO(A,H)ANTHRACENE	21.25	40%	66%	35%	23%	41%	23%	66%
3C	1,2-DICHLOROBENZENE	21.25	26%	99%	44%		57%	26%	99%
3C	1,3-DICHLOROBENZENE	21.25	27%	104%	35%		55%	27%	104%
3C	DIETHYLPHTHALATE	21.25	97%	71%	31%		66%	31%	97%
3C	2,4-DINITROTOLUENE	21.25	122%	104%	69%	69%	91%	69%	122%
3C	FLUORENE	21.25	65%	78%	32%	46%	68%	46%	82%
3C	HEXACHLOROBENZENE	21.25	0%	98%			49%	0%	98%
3C	HEXACHLOROBUTADIENE	21.25	31%	85%	48%		55%	31%	85%
3C	NAPHTHALENE	21.25	56%	89%	59%	46%	62%	46%	89%
3C	PYRENE	21.25	104%	79%	75%	61%	80%	61%	104%
MEAN RECOVERY WITHIN SCAN			64%	89%	59%	51%			
3C	2-CHLOROPHENOL	18.75	25%	77%	50%	34%	46%	25%	77%
3C	2-NITROPHENOL	18.75	30%	114%	51%		65%	30%	114%
3C	PHENOL	18.75	29%	54%	36%	27%	35%	29%	54%
3C	2,4-DIMETHYLPHENOL	18.75	25%	56%	67%	14%	40%	14%	67%
3C	2,4-DICHLOROPHENOL	18.75	45%	79%	68%	15%	52%	15%	79%
3C	2,4,6-TRICHLOROPHENOL	56.25	89%	79%	88%	22%	70%	22%	89%
3C	4-CHLORO-3-METHYLPHENOL	93.75	74%	79%	74%	17%	60%	17%	74%
3C	2-METHYL-4,6-DINITROPHENOL	93.75	100%	126%	88%		105%	88%	126%
3C	PENTACHLOROPHENOL	93.75	142%	186%	56%	9%	98%	9%	186%
3C	4-NITROPHENOL	93.75	60%	70%	22%	35%	47%	22%	70%
3C	2,4-DINITROPHENOL	56.25			65%				
MEAN RECOVERY WITHIN SCAN			61%	91%	60%	22%			

EFFLUENT 2: 3B - LOW SPIKE; 3C - HIGH SPIKE

FIG 1: ROUND ROBIN 88-1; VOLATILES

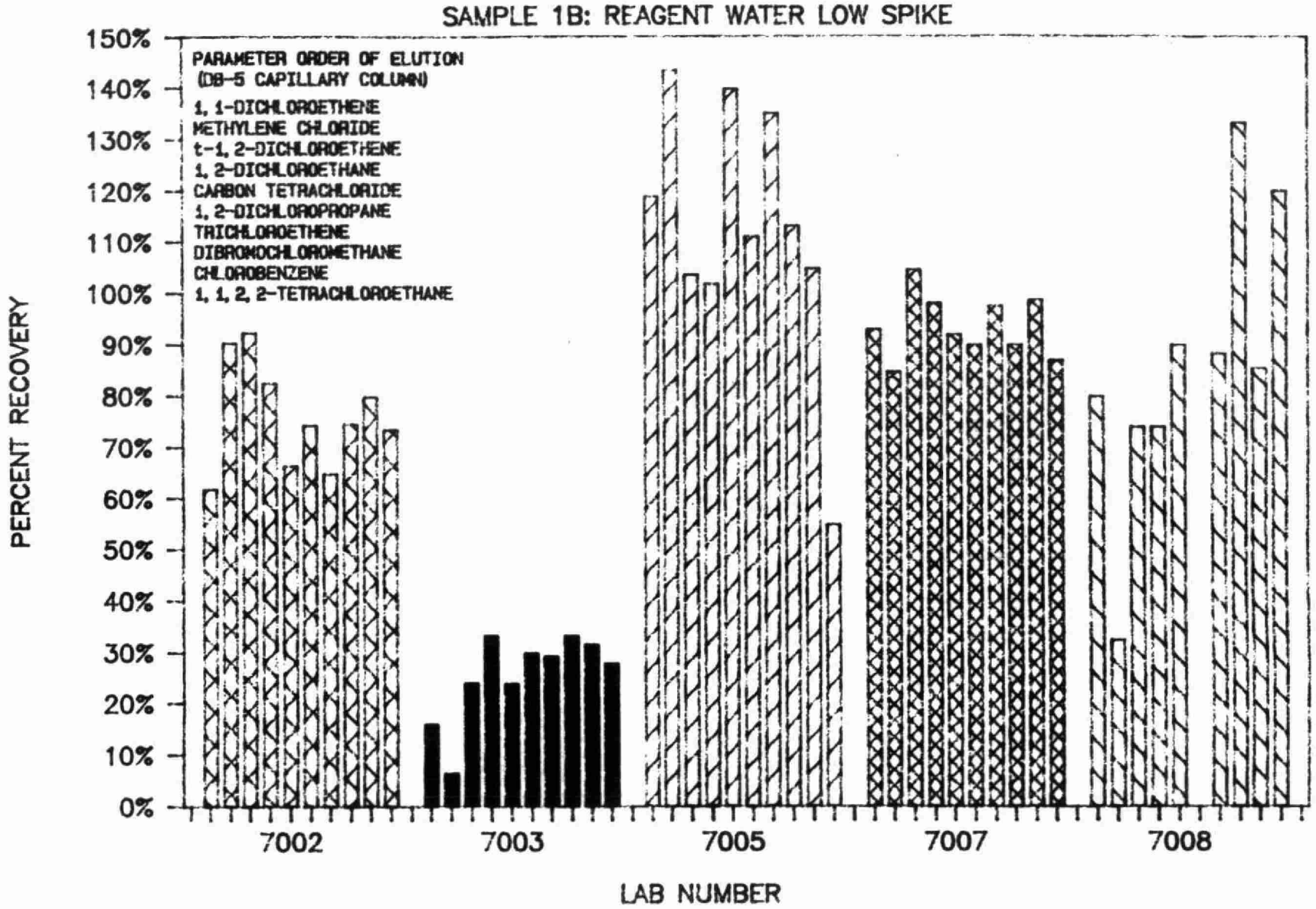


FIG 2: ROUND ROBIN 88–1; VOLATILES

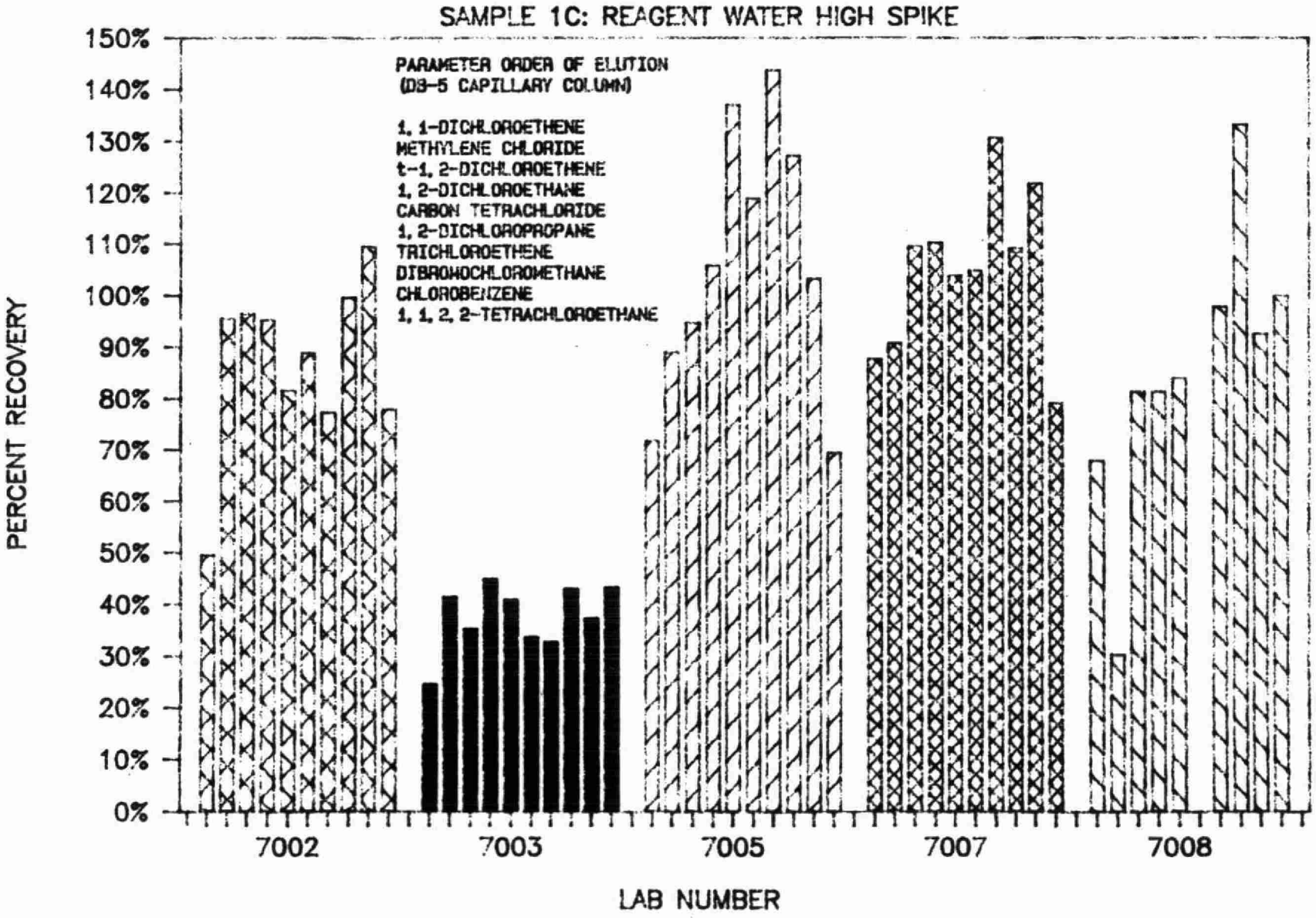


FIG 3: ROUND ROBIN 88–1; VOLATILES

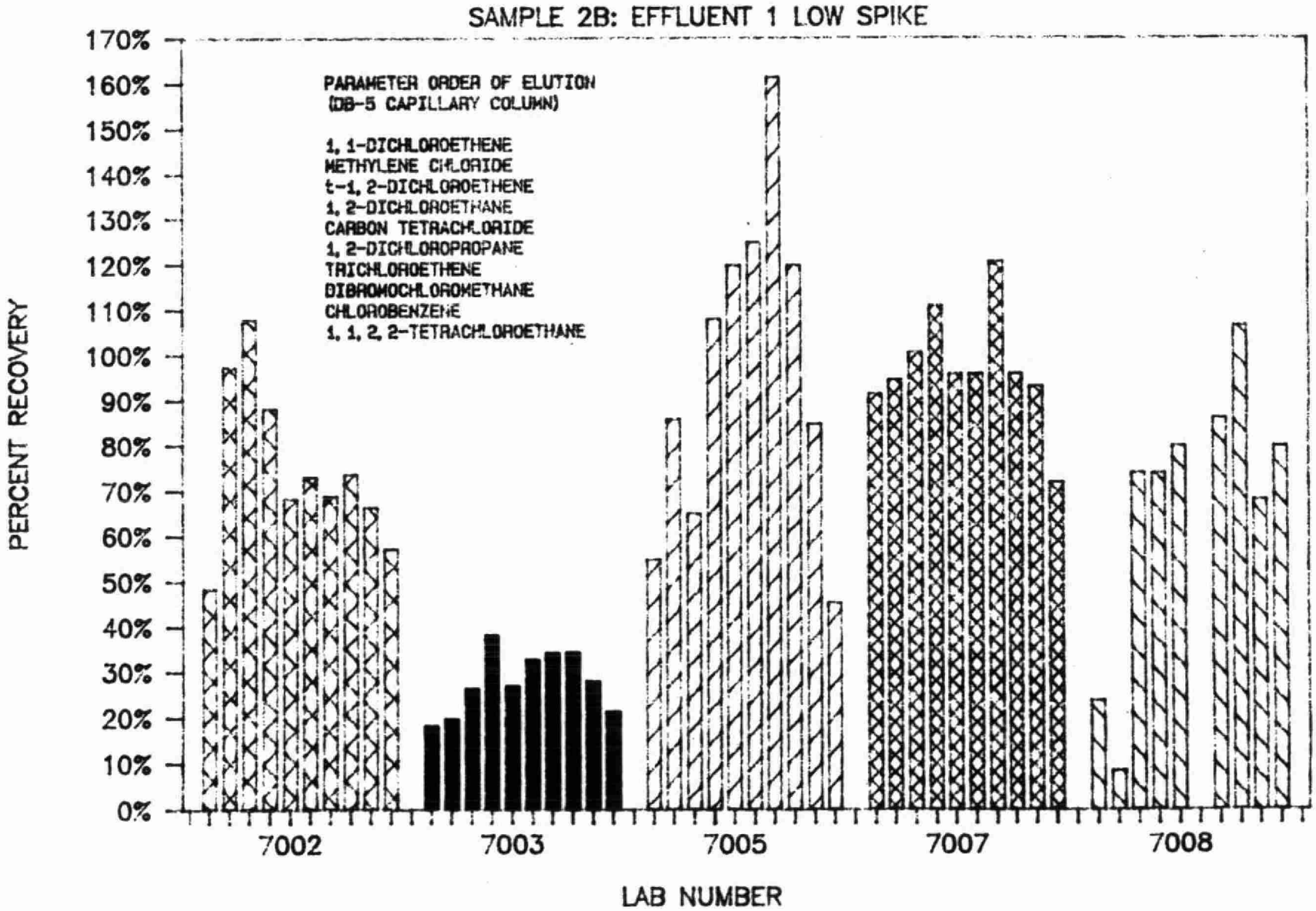


FIG 4: ROUND ROBIN 88-1; VOLATILES

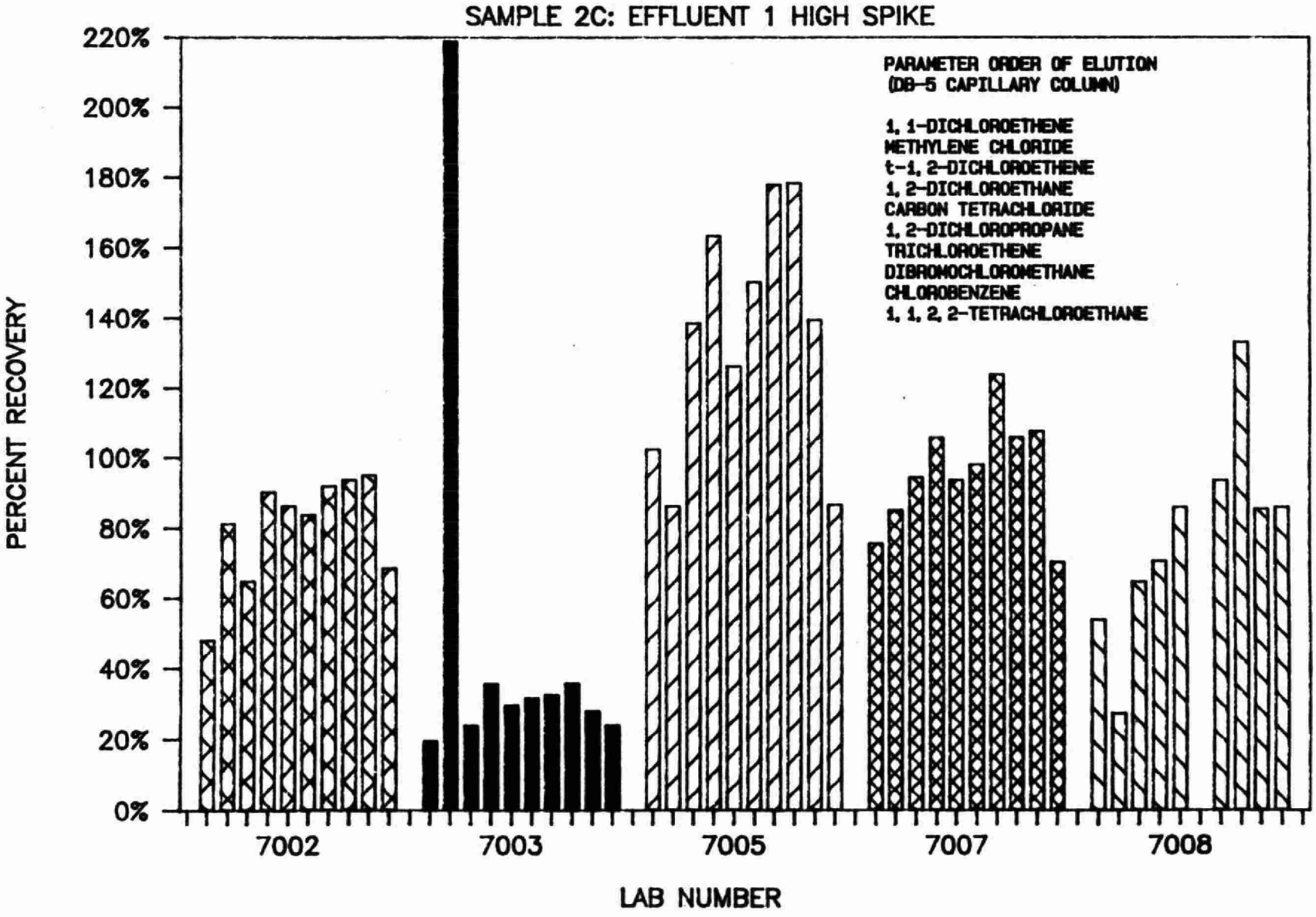


FIG 5: ROUND ROBIN 88-1; VOLATILES

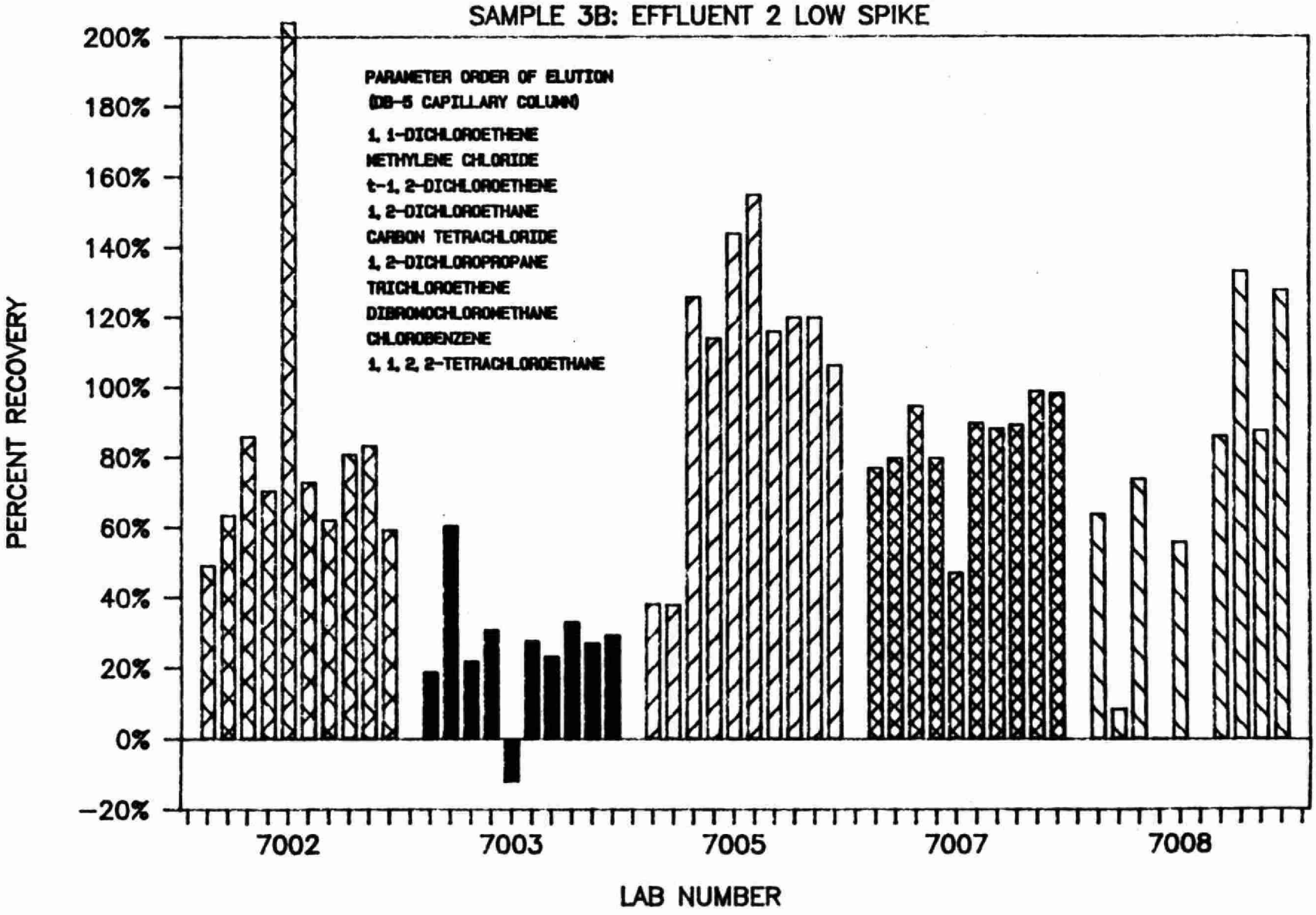


FIG 6: ROUND ROBIN 88-1; VOLATILES

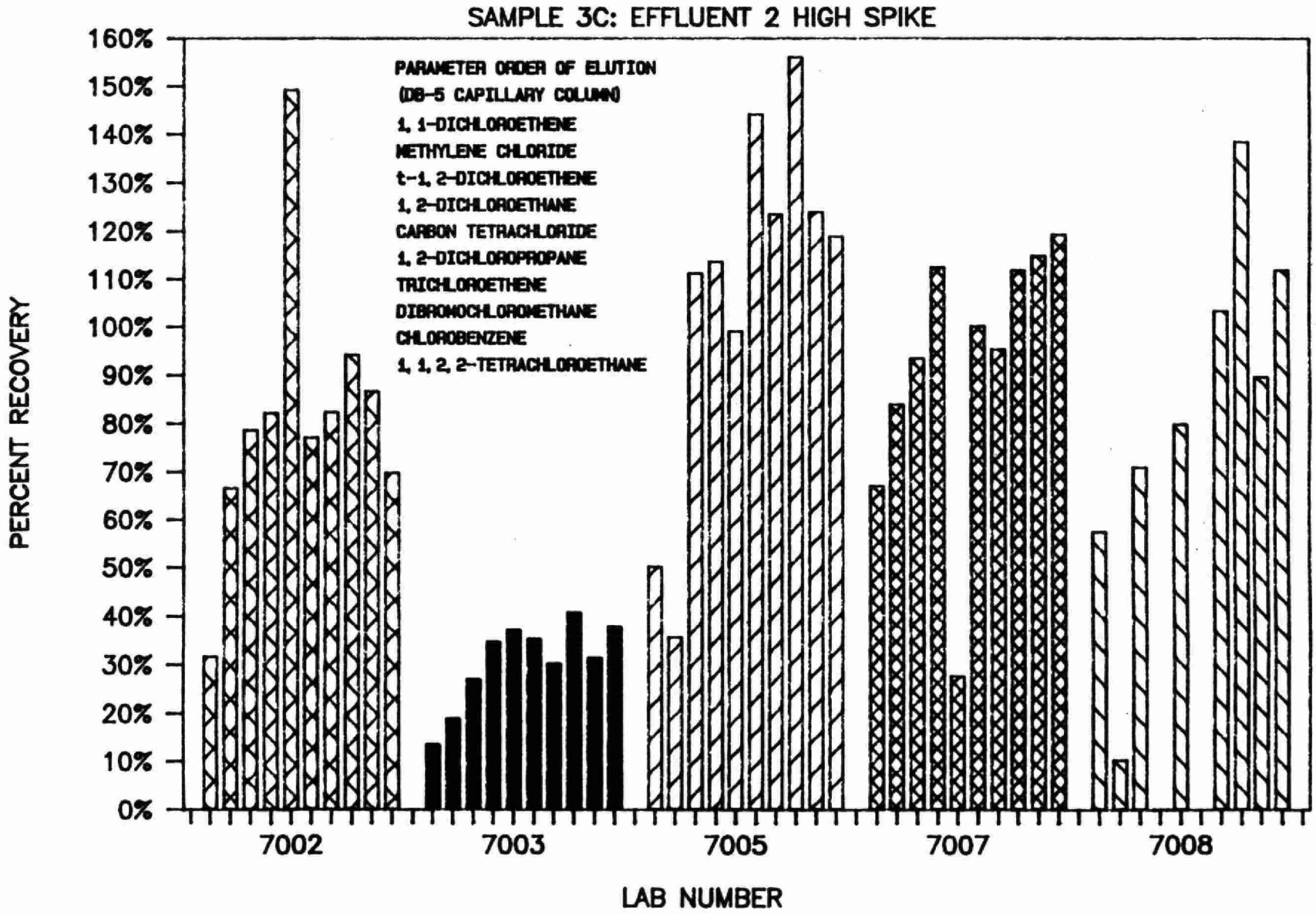


FIG 7: ROUND ROBIN 88-1; BASE/NEUTRAL

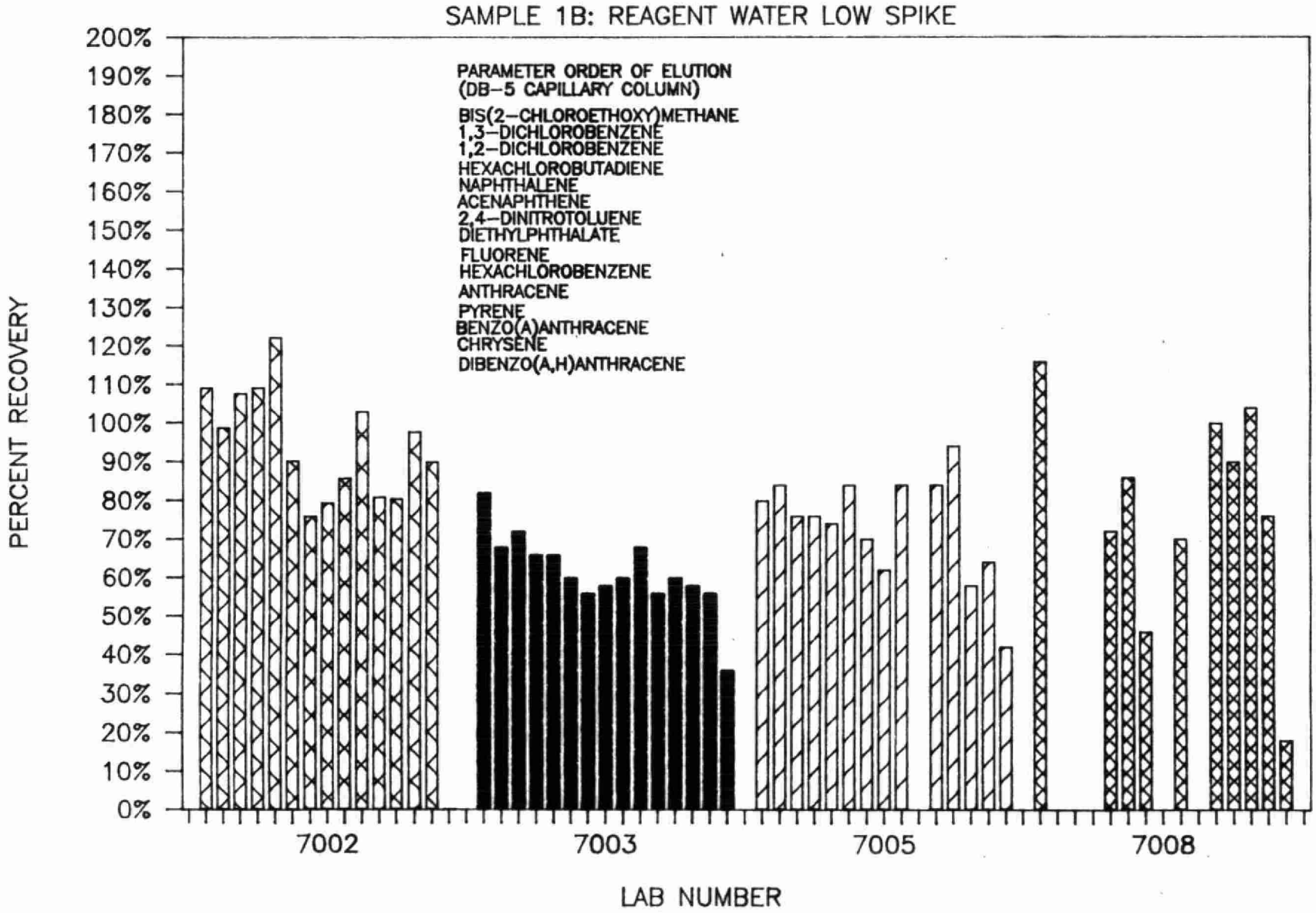


FIG 8: ROUND ROBIN 88-1; BASE/NEUTRAL

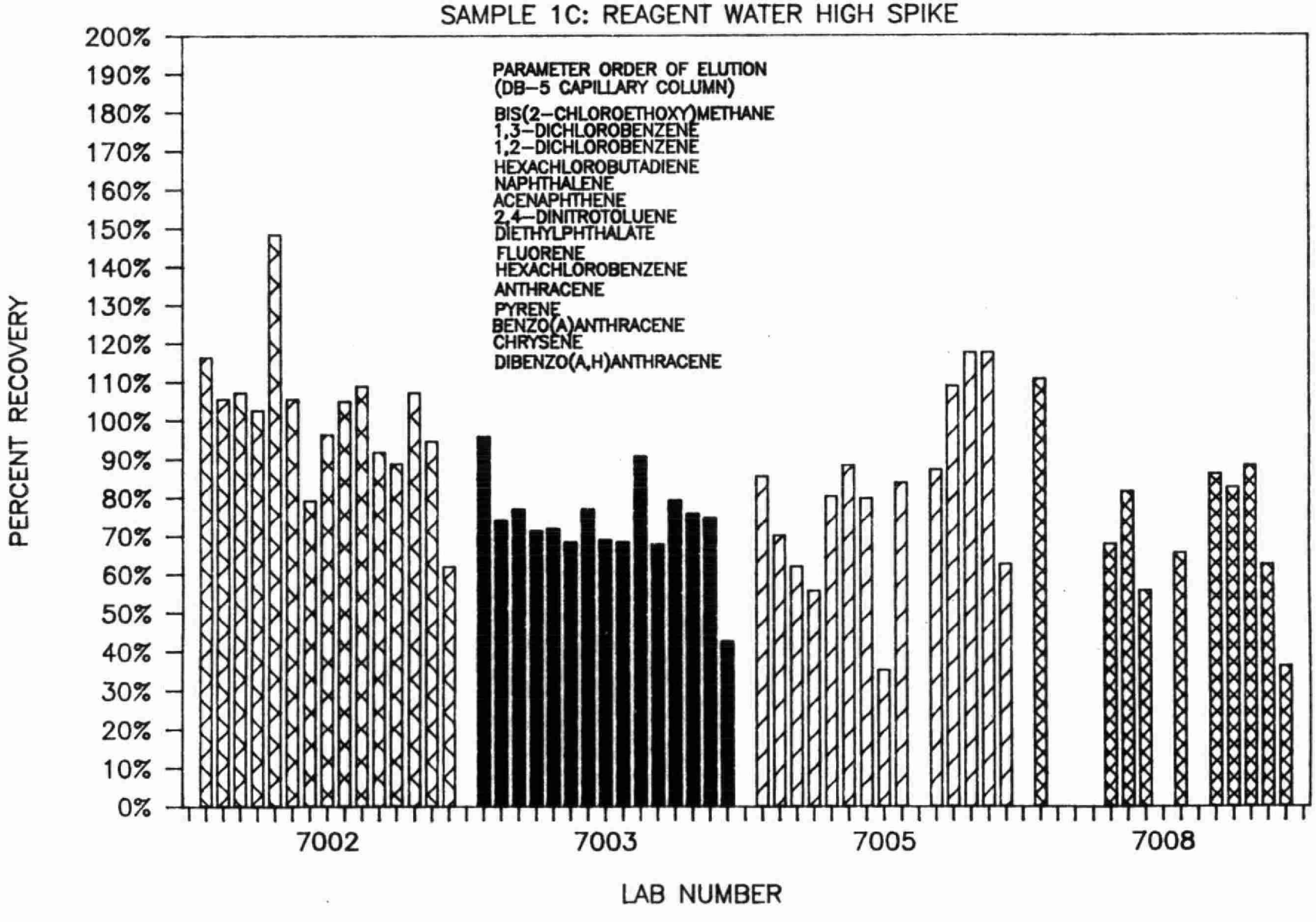


FIG 9: ROUND ROBIN 88-1; BASE/NEUTRAL

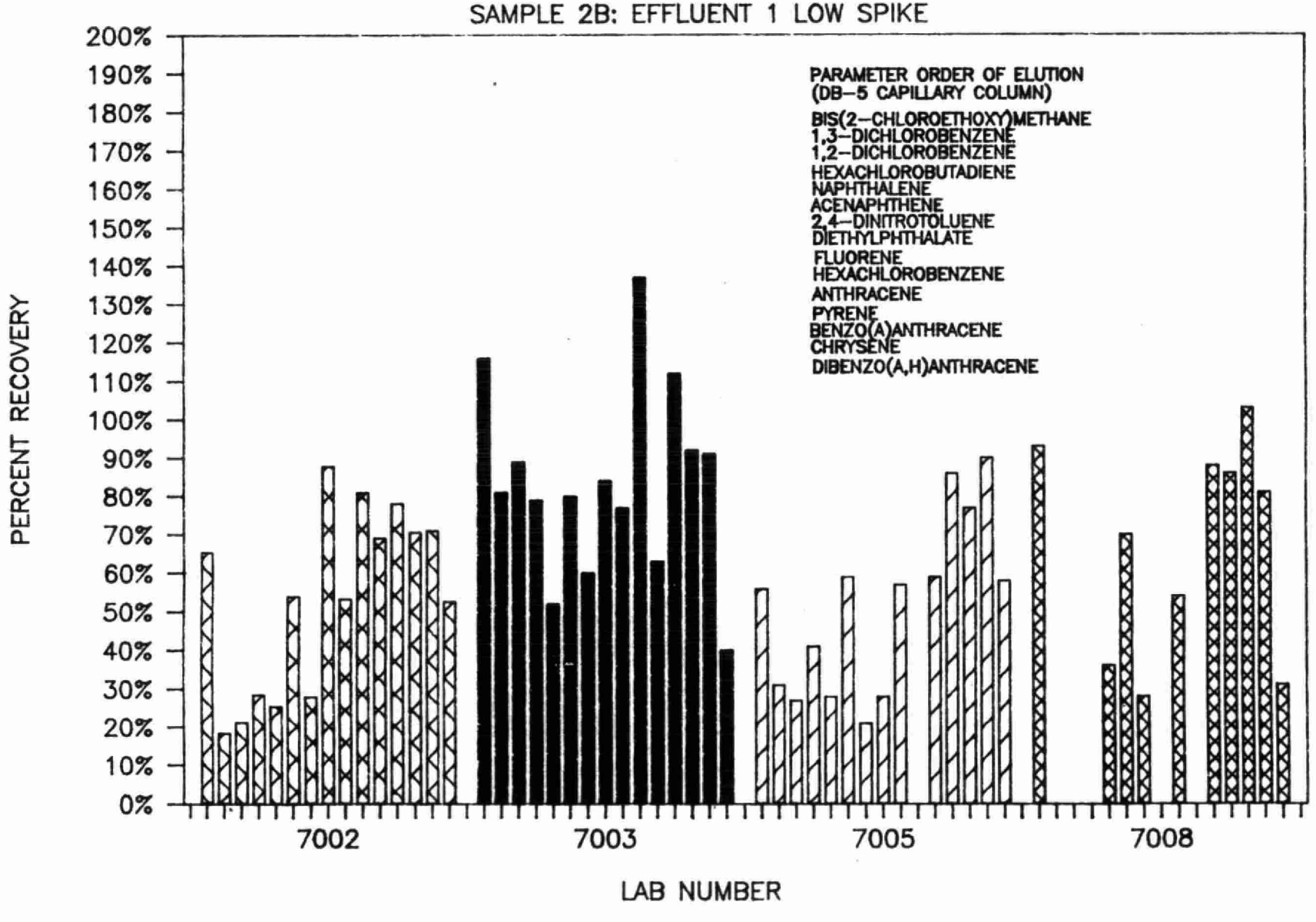


FIG 10: ROUND ROBIN 88-1; BASE/NEUTRAL

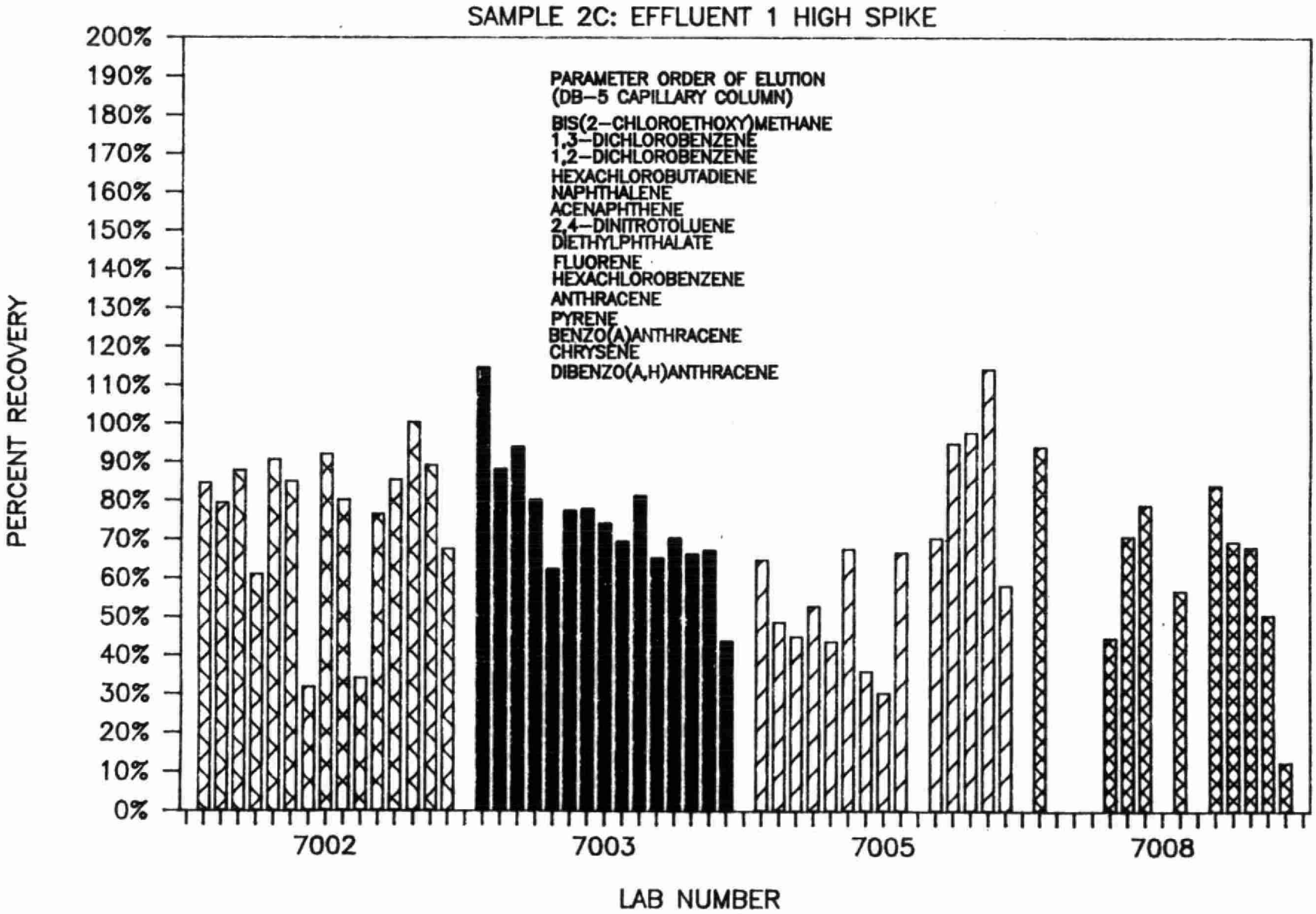


FIG 11: ROUND ROBIN 88-1; BASE/NEUTRAL

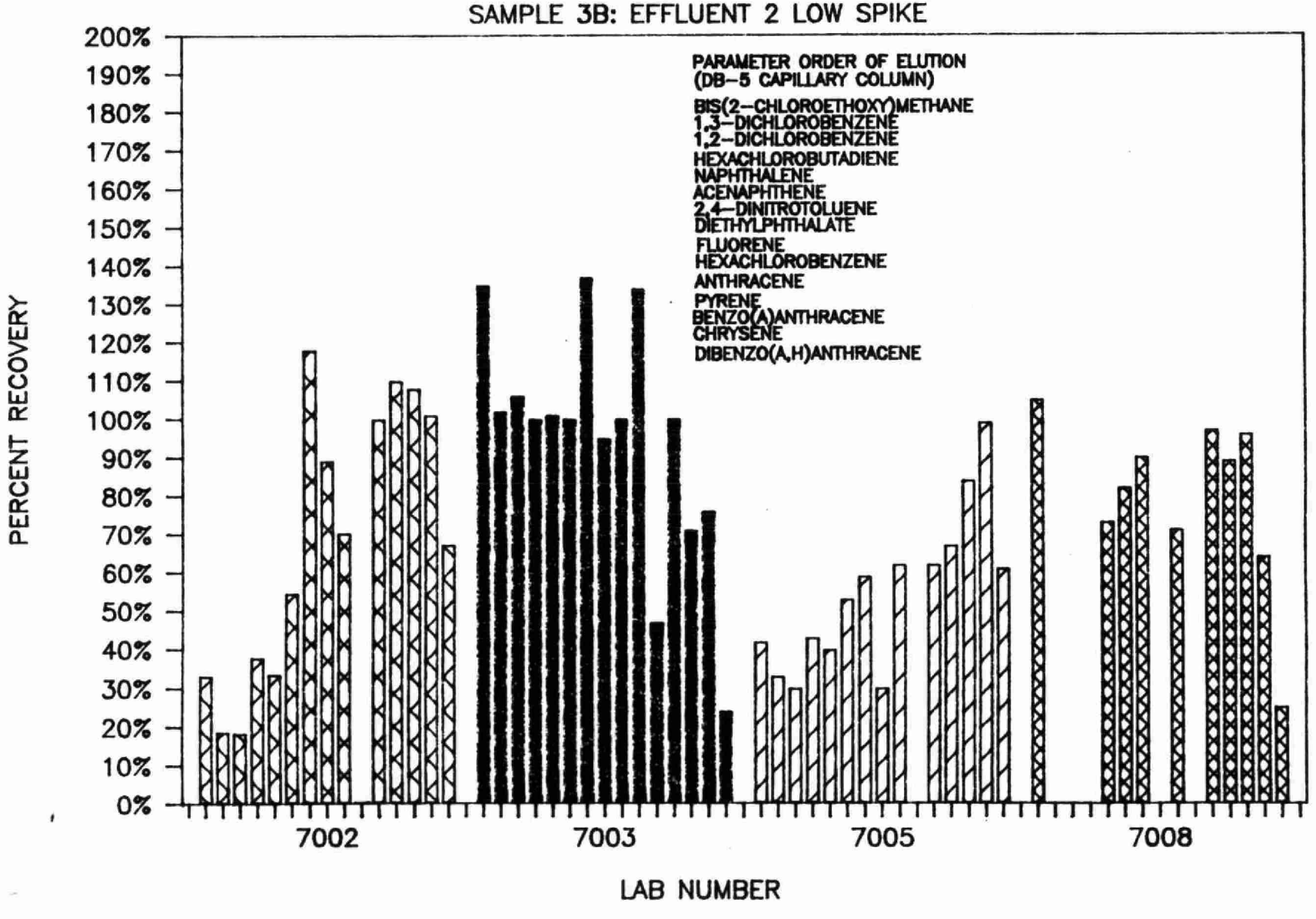


FIG 12: ROUND ROBIN 88-1; BASE/NEUTRAL

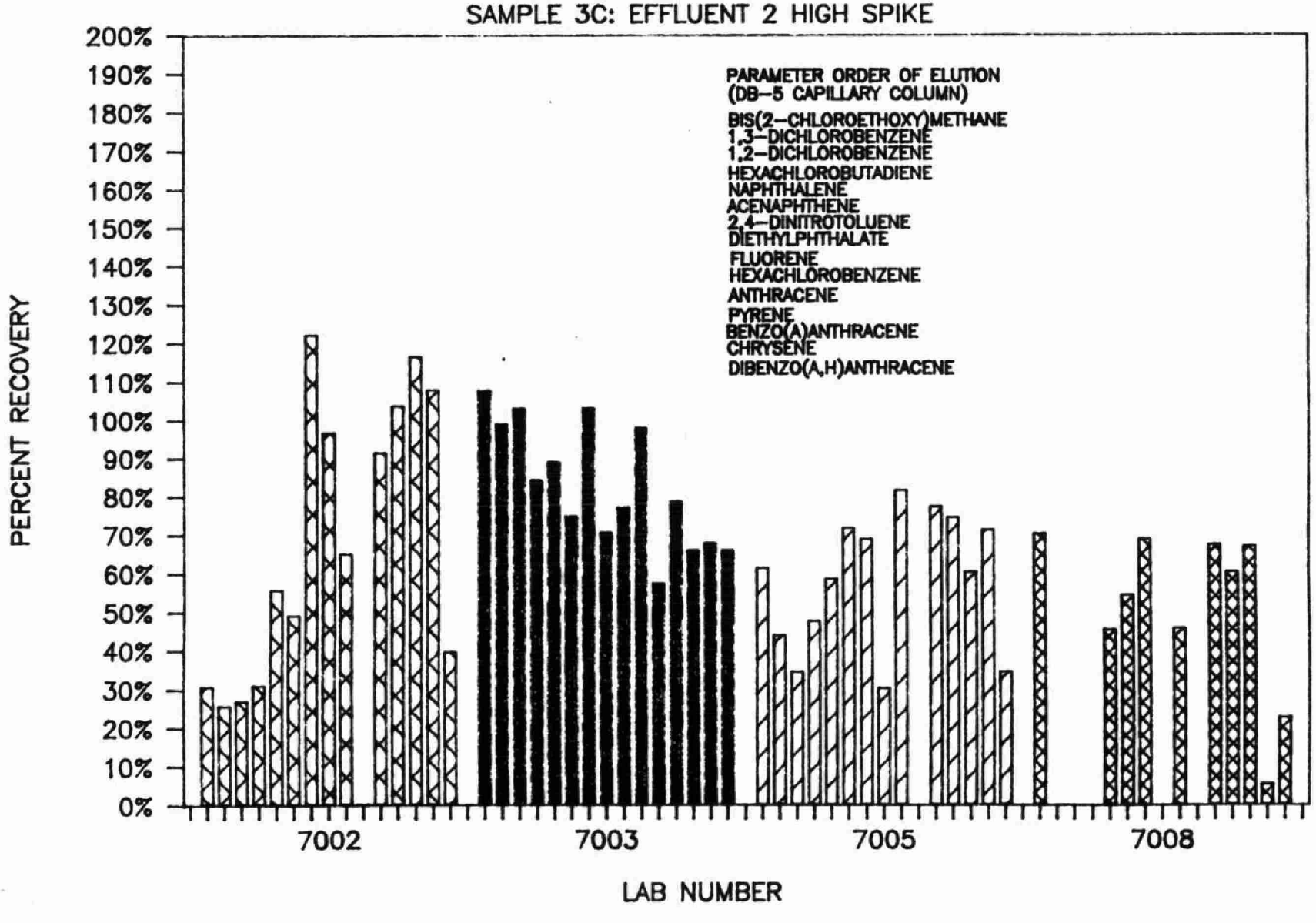


FIG 13: ROUND ROBIN 88-1; ACID EXTRACTABLES

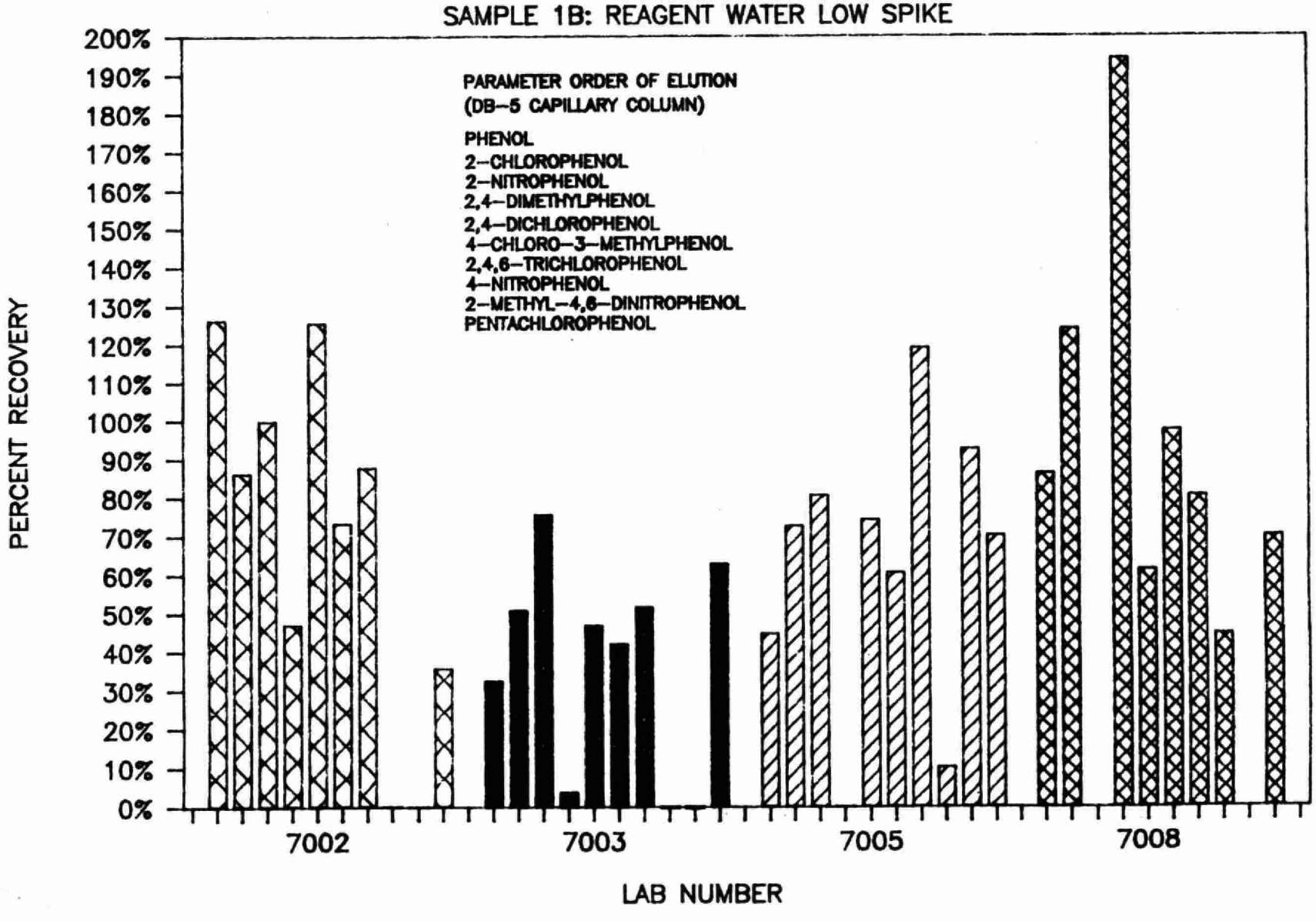


FIG 14: ROUND ROBIN 88-1; ACID EXTRACTABLES

SAMPLE 2B: EFFLUENT 1 LOW SPIKE

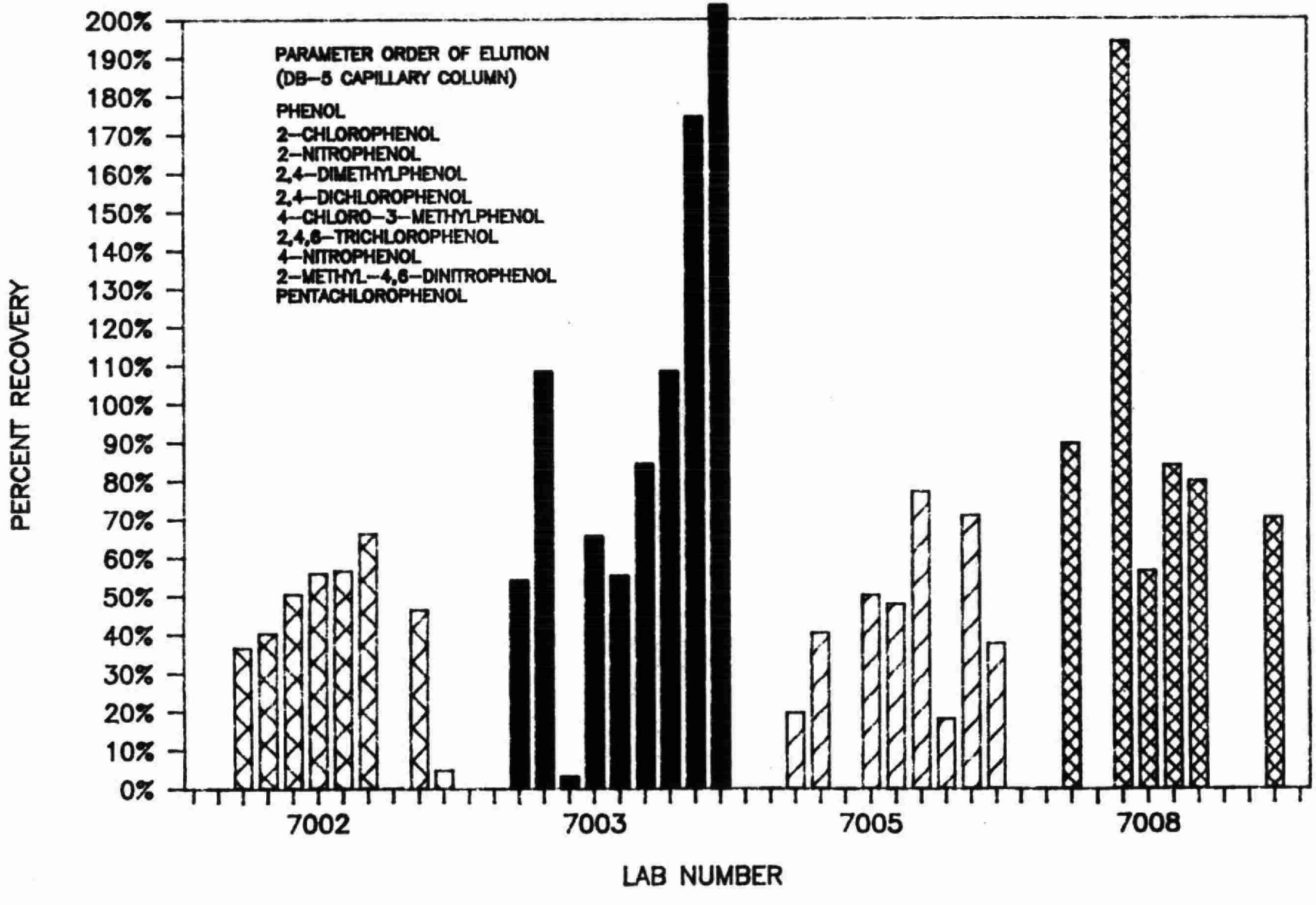


FIG 15: ROUND ROBIN 88-1; ACID EXTRACTABLES

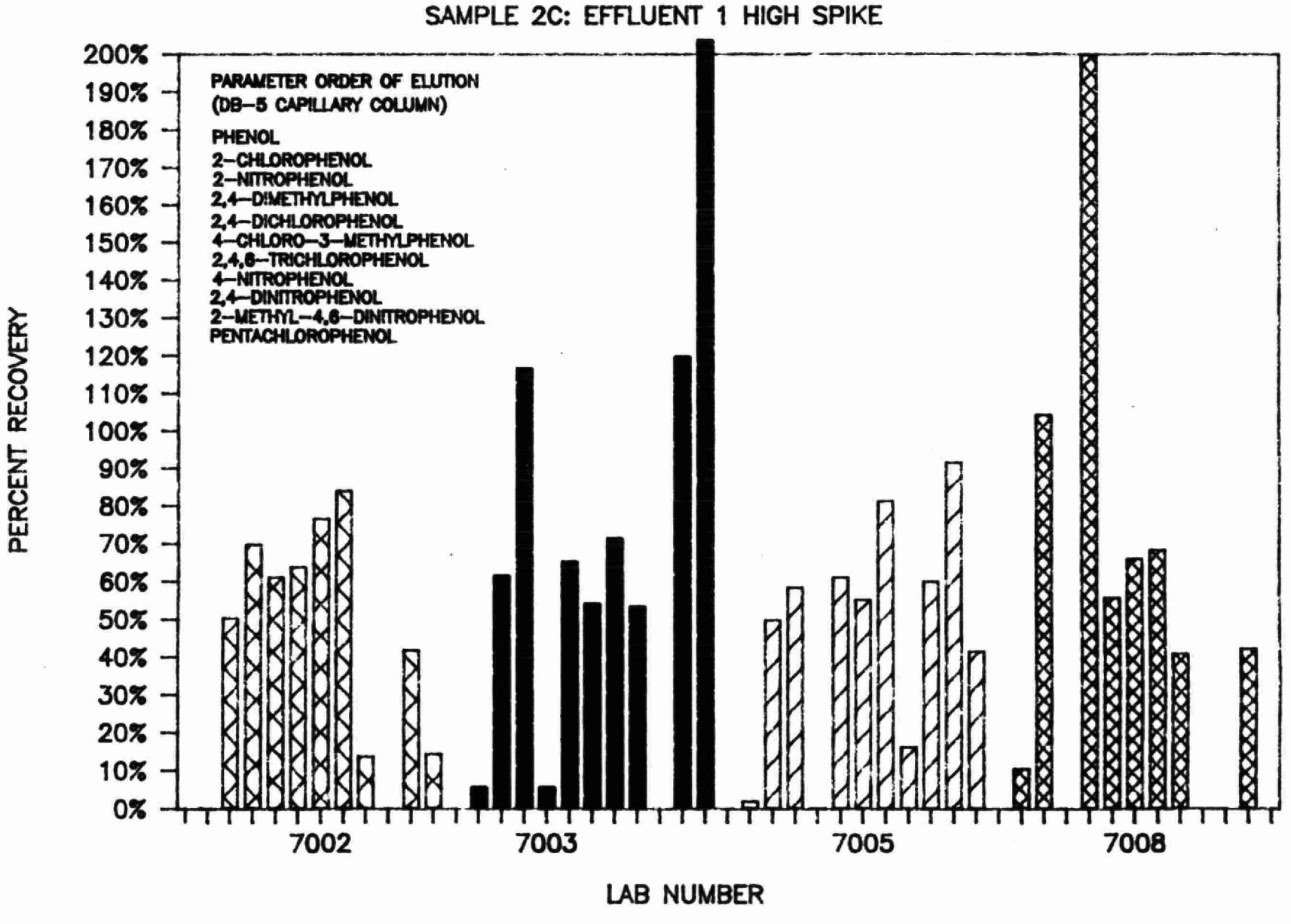


FIG 16: ROUND ROBIN 88-1; ACID EXTRACTABLES

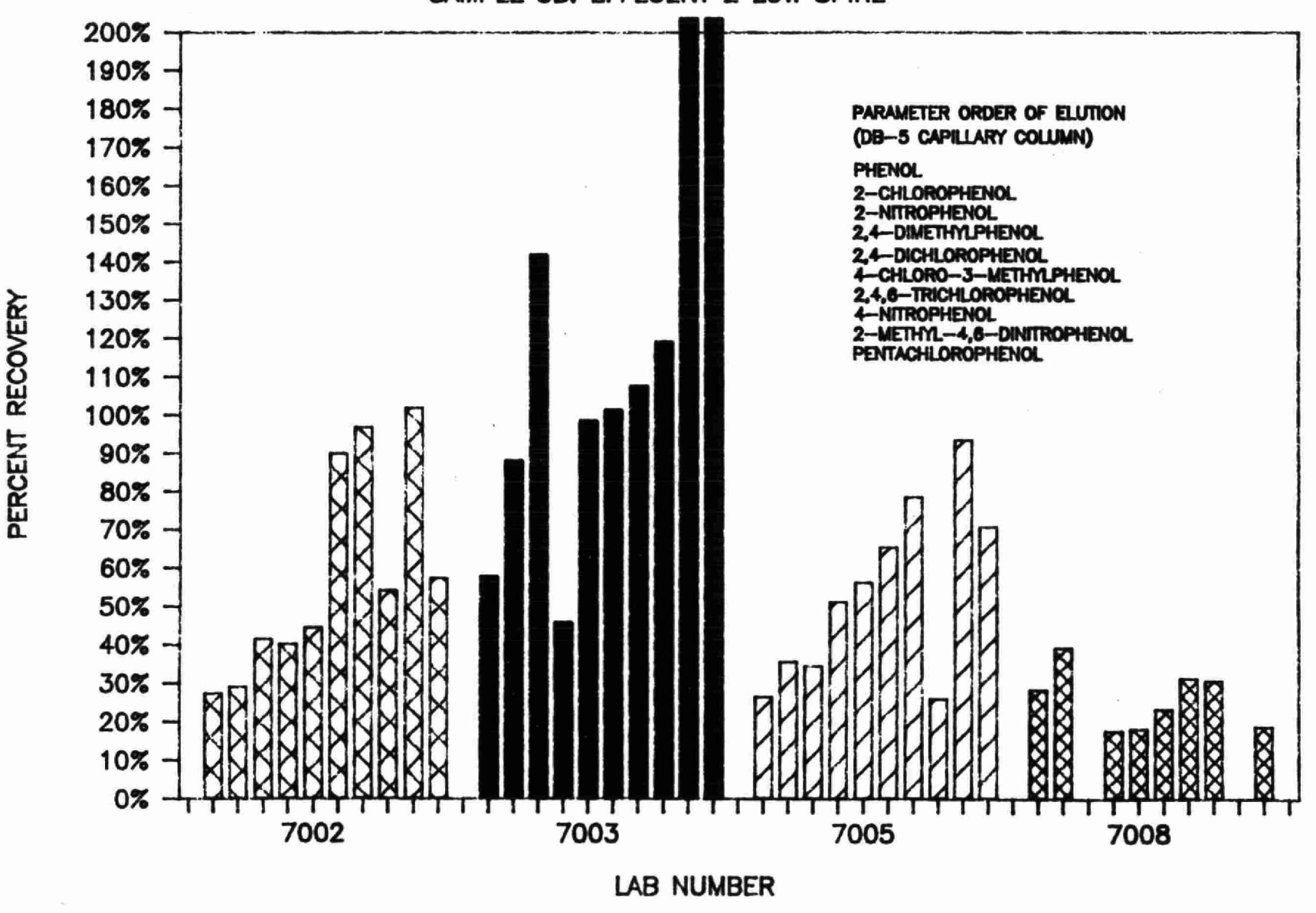
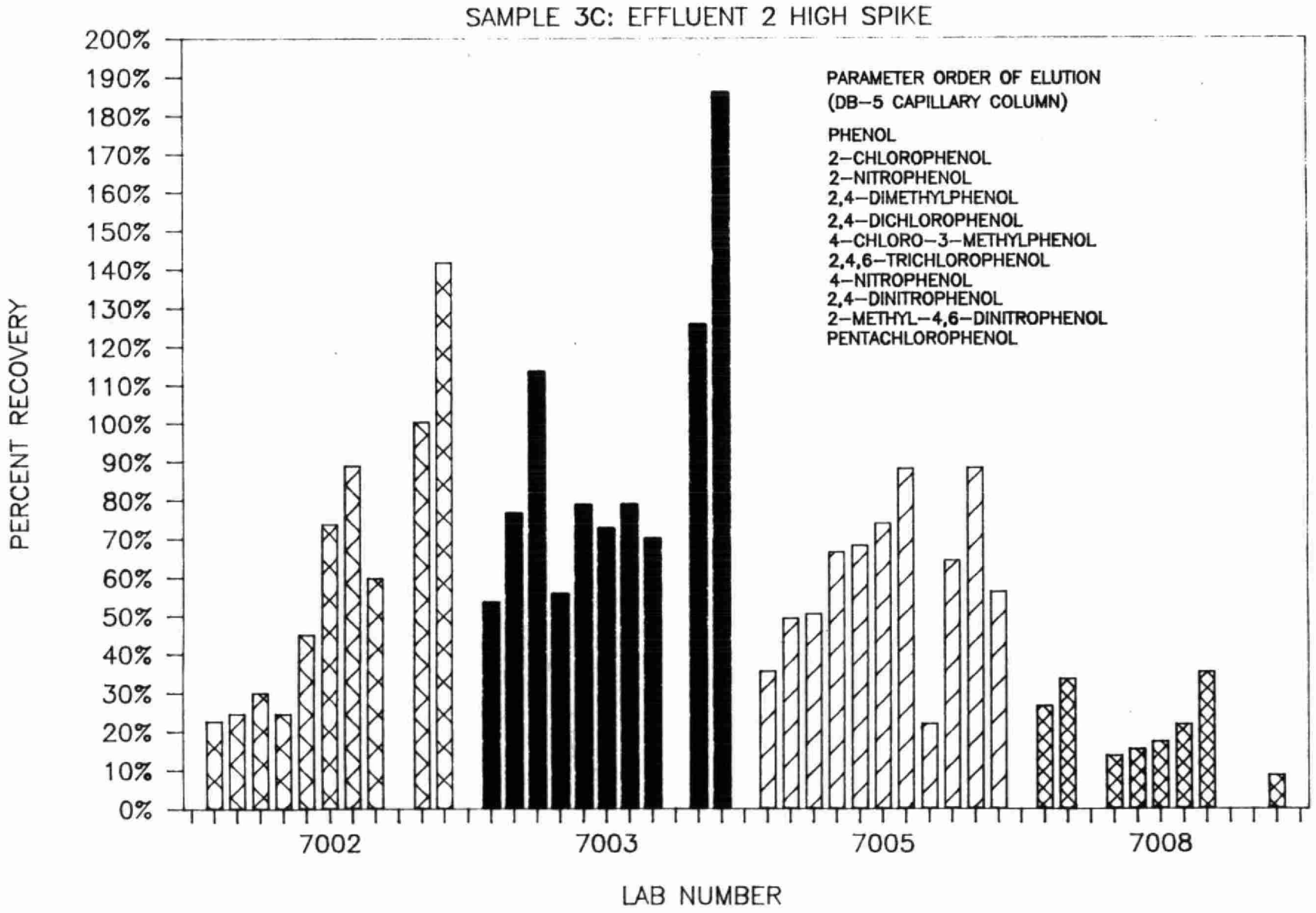


FIG 17: ROUND ROBIN 88-1; ACID EXTRACTABLES



7 APPENDIX 2 - LIST OF PARTICIPANTS AND CORRESPONDENCE

LIST OF PARTICIPANTS

Beak Analytical Services
14 Abacus Rd.
Brampton, Ontario
L6T 5B7
(416) 458-4044

Contact: John Robertson

Mann Testing Laboratories Ltd.
5550 McAdam Rd.
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Contact: Tim Munshaw

Ortech International
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Contact: Jack Brady

Peninsula Chemical Analysis Ltd.
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Contact: R.J. Smythe

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Contact: Dr. R. A. Al-Samadi

Dow Chemical Canada, Inc.
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Contact: Brian Worthington

Ontario Ministry of the Environment
Laboratory Services Branch
Trace Organics Section
125 Resources Rd.
Rexdale, Ontario
M9W 5L1
(416) 235-5760

Contact: Yvonne Jones

MOE INTERLABORATORY VARIABILITY STUDY NOTIFICATION

INTRODUCTION

Private laboratories receiving this notification are invited by the Ministry of the Environment to participate in an interlaboratory variability study of the analysis of organic compounds in effluents from organic chemical manufacturers. Laboratories interested in this program, tentatively scheduled for mid-June, 1988, should contact Sylvia Cussion at (416) 235-5842 of the Ministry of the Environment for details.

BACKGROUND

The Ontario Ministry of the Environment is currently developing monitoring regulations for the Municipal/Industrial Strategy for Abatement (MISA) program. These monitoring regulations will require each direct discharging chemical manufacturer to monitor their effluents for specific compounds.

The following compounds are to be included in this round robin:

Extractables (to be analyzed by GC/MS)

Acenaphthene
Anthracene
Benzo(a)anthracene
Bis(2-chloroethoxy)methane
Chrysene
Dibenzo(a,h)anthracene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
Diethylphthalate
2,4-Dinitrotoluene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Naphthalene
Pyrene
2-Chlorophenol
2-Nitrophenol
Phenol
2,4-Dimethylphenol
2,4-Dichlorophenol
2,4,6-Trichlorophenol
4-Chloro-3-methylphenol
2-Methyl-4,6-dinitrophenol
Pentachlorophenol
4-Nitrophenol

Volatiles (to be analyzed by GC/MS and/or GC/ECD/FID)

Dichloromethane
1,1-Dichloroethene
1,2-Dichloropropane
Trichloroethene

trans 1,2-Dichloroethene	Dibromochloromethane
1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
Carbon tetrachloride	Chlorobenzene

SCHEDULE

During the week of June 13, 1988 participating laboratories will receive a total of eighteen (18) samples for analysis. Nine (9) samples will be for the analysis of extractables and nine (9) samples will be for the analysis of volatiles. Each group of samples will consist of three (3) spiked reagent water samples, three (3) effluent I samples, and three (3) effluent II samples. Within each subgroup there will be one blank and two spiked samples. Effluents I and II will be typical final effluents from two organic chemical industries in the province.

Participating laboratories are expected to analyze the samples within ten (10) days of reception of the samples. Results for all analyses are to be reported within twenty to thirty (20-30) days of recption of the samples to Sylvia Cussion at the following address:

Ministry of the Environment
Laboratory Services Branch
Laboratory Computer Systems - QA/QC Section
125 Resources Rd.
Rexdale, Ontario
M9W 5L1

SUMMARY OF RESULTS

All participating laboratories will be assigned an identification code. All laboratories will receive a complete set of the results, including a ranking for each laboratory. All laboratories will be identified only be their identification code. Any recommendations made by the MOE will also be provided to the individual labs.

Interested laboratories should contact Sylvia Cussion of the Ontario Ministry of the Environment at (416) 235-5842 as soon as possible.

It is the intent of this round robin (along with others) to assess the interlaboratory variability and detection capability for a broad range of organics and inorganics.

Ontario Ministry of the Environment
Laboratory Services Branch
LCS-QA/QC Section
125 Resources Rd.
Rexdale, Ontario
M9W 5L1
(416) 235-5842
FAX (416) 235-5744

June 16, 1988.

TO: PARTICIPANTS OF MOE INTERLAB VARIABILITY ROUND ROBIN

Please find enclosed nine (9) 1000 mL amber bottles and nine (9) 40 mL clear bottles. The samples are labelled as follows:

1000 mL Amber Bottles	40 mL Clear Bottles
Extractables 1A, 1B, 1C	Volatiles 1A, 1B, 1C
Extractables 2A, 2B, 2C	Volatiles 2A, 2B, 2C
Extractables 3A, 3B, 3C	Volatiles 3A, 3B, 3C

If you are missing any of the above items, please contact me at the above phone number immediately.

Your participation in the Interlaboratory Variability Study Round Robin is greatly appreciated by the MISA Analytical Working Group.

As was stated in the notification distributed in May, 1988, samples smould be analyzed within ten (10) days of reception. Store all samples in a refrigerator at 4 degrees Celcius untile ready for analysis. Results are to be reported within twenty to thirty (20-30) days of reception of the samples. Please identify all sample results with your lab identification number and the sample numbers described above. Please contact me if there are any problems or questions re the round robin.

Your lab identification number is:

Sincerely,

Sylvia Cussion
Laboratory Quality Audit Scientist

DATE DUE

QD/143/07/074/MOE
Ontario Ministry of the En
Organic parameters
in reagent water and aakf
c.2 a aa

(7887)
QD/143/07/074/MOE